SEVENTY-FIVE YEARS of MEDICAL PROGRESS 1878-1953

CONTRIBUTORS

Bartemeier, Leo H.

Beecher, Henry K.

Blalock, Alfred

Brinkhous, Kenneth

Bryner, Ulrich R.

Compere, Clinton L.

Cooley, Denton A.

DeBakey, Michael E.

Dowdy, Andrew H.

Eastman, Nicholson J

French, John D.

Hamm, William G.

Hirschman, Louis J.

Kanthak, Frank F.

Lempert, Julius

McLain, Millard H.

McQuarrie, Irvine

Morrissey, John H.

Nanson, Eric M.

Rusk, Howard A.

Simmons, James S.

Sulzberger, Marion B.

Vail, Derrick

Warren, Stafford L.

Wilbur, Dwight L.

Witten, Victor H.

SEVENTY-FIVE YEARS of MEDICAL PROGRESS 1878-1953

Edited and with a Foreword by

LOUIS H. BAUER, M.D., F.A.C.P.

Secretary-General, The World Medical Association;
Past President, The American Medical Association.

LEA & FEBIGER

PHILADELPHIA

1954

Library of Congress Card Catalogue Number: 54-7140
Printed in the United States of America

LIST OF CONTRIBUTORS

LEO H BARTLMEIER, M D

Associate Professor of Psychiatry, Wayne University College of Medicine, Detroit, Michigan, Visiting Professor of Psychiatry, University of Michigan Medical School, Ann Arbor, Michigan

HENRY K BEECHER, M D

Henry I Dorr Professor of Research in Anesthesia, Harvard University, Director of the Department of Anesthesia, Massachusetts General Hospital, Boston, Massachusetts

ALFRED BLALOCK, M D

Professor of Surgery and Director of the Department of Surgery, The Johns Hopkins University School of Medicine, Surgeon in Chief, The Johns Hop kins Hospital, Baltimore, Maryland

KENNETH BRINKHOUS, M D

Professor of Pathology, University of North Carolina School of Medicine Chapel Hill, North Carolina

ULRICH R BRYNER, M D

President, American Academy of General Practice, 1953–1954, Salt Lake City, Utah

CLINTON L COMPERE, M D, F A C S

Assistant Professor, Department of Bone and Joint Surgery, Northwestern University Medical School, Chicago, Illinois

DENTON A COOLEY, M D

Assistant Professor of Surgery, Baylor University College of Medicine, Hous ton, Texas

MICHAEL E DEBAKEY, M D

Judson Taylor Professor of Surgery, Baylor University College of Medicine, Houston, Texas

ANDREW H DOWDY, M D, F A C R

Professor and Chairman, Department of Radiology, School of Medicine, University of California at Los Angeles, Los Angeles, California

NICHOLSON J EASTMAN, M D

Professor of Obstetrics, The Johns Hopkins University School of Medicine, Baltimore, Maryland

JOHN D FRENCH, M D

Chief, Neurosurgery, Veterans Administration Hospital, Long Beach, California, Associate Clinical Professor of Surgery, School of Medicine, University of California at Los Angeles, Los Angeles, California

WILLIAM G HAMM, M D, F.A C S

Clinical Assistant Professor of Surgery (Plastic), Emory University School of Medicine, Emory University, Georgia

LOUIS J HIRSCHMAN, M D, F A C S, F.A P S (HON)

Founder and Emeritus Professor of Proctology, Wayne University Medical College, Detroit, Michigan

FRANK F KANTHAK, M D, F A C S

Instructor in Surgery (Plastic), Emory University School of Medicine, Emory University, Georgia

JULIUS LEMPERT, M D, F.A A O O

Director of Otologic Surgery, Otologic Research and Postgraduate Teaching' Lempert Institute of Otology, New York, New York, Research Professor of Otology, Tufts Medical School, Boston, Massachusetts

MILLARD H McLAIN, M D

Department of Medicine, Stanford University School of Medicine, San Francisco, California

IRVINE McQUARRIE, A B, PH D, M D

Professor and Head of the Department of Pediatrics, University of Minnesota Medical School, Minneapolis, Minnesota

JOHN H MORRISSEY, M D , F A C S

Director of Urology, City Hospital of New York, Assistant Attending Urologist, New York Hospital, Urologist, St Clare's Hospital, New York, New York

ERIC M NANSON, M B , Ch B (N Z), F R C S (Eng)

Associate Professor of Surgery, The Johns Hopkins University School of Medicine, Baltimore, Maryland

HOWARD A RUSK, M D

Professor and Chairman, Department of Physical Medicine and Rehabilitation, New York University College of Medicine, New York, New York

JAMES S SIMMONS, M D , Ph D , Dr P H , S D (Hon)

Brigadier General, U S Army (Retired), Dean and Professor, Harvard University, School of Public Health, Boston, Massachusetts, Former Chief Preventive Medicine Service, Office of the Surgeon General, U S Army, 1940–1946

MARION B SULZBERGER, M D , F A C P

Professor and Chairman, Department of Dermatology and Syphilology, New York University Post Graduate Medical School, and Director of Dermatology, Skin and Cancer Unit, University Hospital, New York University-Bellevue Medical Center, New York, New York

DERRICK VAIL, M D

Professor and Chairman, Department of Ophthalmology, Northwestern University Medical School, Chicago, Illinois

STAFFORD L WARREN, M D

Professor and Chairman, Department of Biophysics, School of Medicine, University of California at Los Angeles, Los Angeles, California

DWIGHT L WILBUR, M D

Clinical Professor of Medicine, Stanford University School of Medicine, San Francisco, California

VICTOR H WITTEN, M D

Instructor in Clinical Dermatology and Syphilology, New York University Post Graduate Medical School, Assistant Attending Physician in Dermatology and Syphilology, Skin and Cancer Unit of University Hospital, New York University Post Graduate Medical School, and Assistant Visiting Dermatologist and Syphilologist, Bellevue Hospital, New York, New York

FOREWORD

ORDINARILY we think of growth as a slow process, easily recognizable after it has occurred, but rarely sufficiently rapid for us to observe it with the naked eye

In the last seventy five years, however, doctors and laymen have had an opportunity to watch and marvel at the swift and very visible growth of medical knowledge During this relatively brief period of time—little more than the span of an ordinary lifetime in these days of increasing longevity—medical scientists have learned more about the nature and treatment of disease, and about its prevention, than in the previous three thousand years

This is somewhat startling, when stated so bluntly Yet ordinarily we take it too much for granted New discoveries and theories are developed with such frequency, new drugs, new treatments, and new methods are presented in so many journals and papers, that it is almost impossible to absorb them all Even physicians tend to restrict their studies to their own particular fields of medical practice and have only a general idea of the outstanding advances of medicine as a whole

That is why this book, which summarizes both the story of the past seventy five years in medicine and the present extent of our knowledge, will be invaluable to all who read it Nowhere else in print is there a similar compilation of the progress of the last seven decades, combined with a synthesis of modern practice in all the specialties, as seen by specialists themselves In the field of each specialty, moreover, as well as in the field of general practice, the material which is presented by nationally recognized experts, is an authoritative clinical summary of many of the best and most advanced techniques

The unique nature of the book is a result of the First Western Hemisphere Conference of The World Medical Association, which was held in Richmond Virginia, in April, 1953 The theme of the Conference was the commemoration of seventy five years of medical progress Men of distinguished attainments in each of the nineteen medical specialties, as defined by the Advisory Board for Medical Specialties, as well as a representative of general practice, were invited to contribute papers on the history and the present status of their particular fields in medicine The book is a compilation of these papers, publication of which has been made possible through a grant from the A H Robins Co , Inc

Whoever reads this book and integrates the information in its chapters will have before him a complete picture—the picture of contemporary medicine, an account of the increasing victories of man in his war against disease

LOUIS H BAUER, M D

CONTENTS

HENRY K BEECHER

1

ANESTHESIOLOGY

By Henry K Beecher, M D

Henry I Dorr Professor of Research in Anesthesia, Harvard University, Director of the Department of Anesthesia, Massachusetts General Hospital, Boston, Massachusetts

THE SEARCH FOR GOALS AND STANDARDS

IT IS a good thing to look back from time to time in order to get our bearings We can hardly know where we are going, unless we know whence we came, lest we end up where we started A lot of circular travel is incidental to progress, discovery and rediscovery again and again seems to be the rule Such waste could be avoided if the past were not so often ignored The Diamond Anniversary of Medical Progress is a good time to look back An attempt to appraise the great developments of these turbulent and exciting and productive years has great practical point it is far easier to see by hindsight than it is in the present which things are important and which trivial So a backward look is important not only so that the waste of rediscovery of truths already known can be avoided, but so that we can calibrate our judgment Knowing what sorts of advances have weathered time, we have standards and from them we should be better able to estimate what the future of recent developments will be More important than this, we can infer where and what kinds of efforts are likely to be of lasting value in the future We can see where to direct our efforts

It must be made clear at once that no attempt will be made here to cover *all* great advances, but instead to try to see by hindsight what type of discovery has over the years proved significant We shall inspect various types of advance, with no attempt to cover all examples of each type

The purpose here is to appraise the developments in anesthesia of the last seventy five years Since anesthesia, unlike surgery, is of comparatively recent origin, we can go right back to the beginning to get a base line for reference It will be useful to educate afresh our eye and mind by scanning the scene from the beginning of anesthesia time We

shall then with these standards be better equipped to examine the last seventy five years and to appraise the developments of this period

Anesthesia is the bridge between two great disciplines pharmacology and surgery More than any one else within the hospital the anesthetist has the opportunity to act as, to be, the pharmacologist in caring for the sick In this role he has extraordinary possibilities for advancing human pharmacology The close link of pharmacology and anesthesia begins in their common history Modern pharmacology is one of the youngest of the basic medical sciences [1] Its growth as a formal discipline has occurred chiefly in the twentieth century Only three discoveries of major importance to pharmacology were made in the nineteenth century anesthetics antiseptics and endocrine therapy, as pointed out by A J Clark

Discovery of the action of the thyroid led to the introduction of endocrine therapy and the development of a new branch of science began, one which continues to grow at an exceedingly rapid rate Antiseptics, once used, quickly assumed a position of great importance which was somewhat weakened by the advent of aseptic surgery Anesthesia has continued to grow Before its introduction speed in surgery was an essential As Sir Clifford Allbutt said, "Surgeons operating upon the quick were pitted one against the other like runners on time He was the best surgeon, both for patient and onlooker, who broke the three minutes record in an amputation or a lithotomy What place could there be in record breaking operations for the fiddle faddle of antiseptic precautions? The obvious boon of immunity from pain, precious as it was, when we look beyond the individual, was less than the boon of time With anaesthetics ended slapdash surgery, anaesthetics gave time for the theories of Pasteur and Lister to be adopted in practice"

I refer to this example to remind you that anesthesia is no isolated subject rather it is an intimate part of the practice of medicine, its materials and techniques indispensable in the practice of medicine as we know it Anesthesia is not limited in historic importance to its clinical aspects In the basic science of pharmacology we find that the introduction of anesthesia marked the first occasion when the synthetic products of the organic chemist were used to cause a therapeutic effect of first importance [1] The introduction of anesthetics marked the beginning of the modern growth of pharmacology

Let us consider first in general terms what the broad meaning of anesthesia has come to be over the years of its history It is a condition in which the normal responses to stimuli of the whole or a part of the body are temporarily depressed The term anesthesia can be applied to the complicated reversible depression of the senses or automatic activity of higher forms of life, usually by drugs, but also on occasion by physical means The primary characteristic of general anesthesia in man is loss of consciousness. The reversible nature of the process is one of its out

standing characteristics It has points in common with the unconscious state produced by other means, as, for example, rhythmically recurring sleep There is much evidence to indicate that anesthesia is akin to sleep The transient nature of the process without serious sequelae, the quick recovery, and the smooth transition from "sleep" produced by drugs to physiological sleep are points which suggest that the state of anesthesia is not altogether a grossly abnormal condition, not necessarily a seriously traumatic process What, then, are the advances which have been made toward this goal?

THE ROOTS OF MODERN ANESTHESIA IN AGENTS AND TECHNIQUES

Inhalation Agents

In their discoveries of inhalation anesthesia during the 1840's, Crawford Williamson Long, Horace Wells, and William Thomas Green Morton were of course preceded by the discovery of Humphry Davy, made in 1799

Nitrous Oxide —In Sir Humphry Davy's report of his superb investigation of nitrous oxide, in 1799, when he was a youth of twenty, he describes repeatedly the use of nitrous oxide to produce analgesia with little or no disturbance of consciousness For example, on page 464, " when [he] had a head ache from indigestion, it was immediately removed by the effects of a large dose of gas " "The power of the immediate operation in removing intense physical pain [he] had a very good opportunity of ascertaining," for on being disturbed by a painful dental infection he breathed nitrous oxide and, "The pain always diminished after the first four or five inspirations and was swallowed up in pleasure " Later (p 481) as an experiment he "drank a bottle of wine in large draughts in less than eight minutes " Subsequently, he "was awakened *by head ache and painful nausea* " *On breathing nitrous oxide, he re*ports that he "was unconscious of head ache after the third inspiration . and continued for some minutes much exhilarated " He concluded, and here is where anesthesia comes in (p 556), "As nitrous oxide in its extensive operation appears capable of *destroying* physical pain, it may probably be used with advantage during surgical operations " It can be recalled only with chagrin that close to a half century went by before Davy's well informed suggestion was accepted by the medical profession, and even now he is often not adequately credited

Would Bell have been any less the inventor of the telephone if mankind had refused to use the instrument? Davy is no less the real discoverer of anesthesia simply because the physicians of his day were too obtuse to follow his published recommendations [2]

The fact that Davy's suggestion of the therapeutic uses of nitrous oxide was ignored for more than forty years, as Clark has pointed out,

while the fact that nitrous oxide produced a ludicrous form of intoxication, was easily seized upon and exploited is somewhat disturbing to contemplate These foolish demonstrations had some value, however, for a dentist from Hartford, Connecticut, Horace Wells, saw one of these displays of laughing gas and on December 11, 1844, arranged for the gas to be used upon himself, a painless extraction of a tooth under anesthesia was achieved In January, 1845 Wells tried to demonstrate the use of the gas at the Harvard Medical School but the demonstration was a partial failure and he later killed himself With the excitement attendant upon the introduction of ether anesthesia in 1846, nitrous oxide was pushed into the background and to a certain extent forgotten Nitrous oxide did not become truly feasible as an anesthetic agent until 1868, when Edmund Andrews of Chicago showed the advantage of using nitrous oxide, with 10 per cent oxygen interestingly enough, a method that Davy had investigated on animals nearly seventy years before Doubtless if nitrous oxide could have been administered as simply with as simple equipment as ether, it would long before have sprung into prominence as an anesthetic agent

Ether —Ether was one of the earliest known of the synthetic organic drugs, its synthesis having been described by Valerius Cordus (at the age of twenty five in 1540 Two and a half centuries later Dr Pearson, in 1795, used ether in the treatment of phthisis He suggested its investigation to Beddoes who tried it a few times at the Pneumatic Institute and found it to be useful as an anodyne [1] It would seem that its intoxicating power soon became fairly common knowledge In 1818 a note believed to have been written by Michael Faraday pointed out that ether had intoxicant effects similar to those of nitrous oxide Certainly the medical profession had some knowledge of the intoxicant action of ether, and probably a good many persons knew that excess of ether might lead to unconsciousness In 1845 Jackson and Morton both witnessed Wells's demonstration with nitrous oxide which failed Undoubtedly the first to use ether as an anesthetic for a surgical procedure (unless we accept a reported[2] tooth extraction under ether at Rochester New York, in January, 1842), was Crawford Long who had been a student in medicine at the University of Pennsylvania Following his training he had returned to his native Georgia He stated that the people in the town had become interested in the exhilarating effect of nitrous oxide and asked him to prepare some of it for them Lacking the required apparatus he could not do this, but suggested that they try ether as a substitute He took part in these so-called ether frolics and observed that he would find bruises on his body, yet he was not able to recall pain as a result of the blow which caused them From this he was induced to try ether in surgical operations, and on March 30, 1842, he removed a tumor from the back of the neck of James M Venable, for which he charged two dollars As a result of this and subsequent uses of ether very little if anything transpired Great con

troversy raged over reasons for the lack of influence of Crawford Long's demonstration, and it was not until October 16, 1846, that Morton carried out the demonstration of surgical anesthesia which led to its adoption throughout the medical world. According to Underwood,[4] the method was apparently given a trial in Scotland as early as November, 1846, thus antedating Liston's famous London operation (December 21, 1846) by some four weeks. Later, in 1848, an Englishman writing on anesthesia stated: "It fell on no dull or idle ears. It was taken up, tried and in a few days it filled the island. The profession was surprised, excited, and charmed in the mass, and more especially those on the sunny side of the grand climacteric. The elderly gentlemen had their preconceived and heretofore settled notions sadly jostled and disturbed, not a few grew irritable and resented the interference, but the thing was too fast, the first impulse too strong, and the promoters too numerous and nimble to be so obstructed." (I can mention a curious example of reluctance of the elderly to take in new advances. Certainly Henry Jacob Bigelow was one of the prime movers in the introduction of surgical anesthesia in the 1840's, but by the time surgical antisepsis had come into being nearly twenty-five years later, Bigelow had aged, and he could see little if any good in such practice.) It is an ominous thing that so many of the great discoveries are made by *young* men. Clark says: "In the case of nitrous oxide it was necessary to explain and palliate the inertia of our profession but the history of the reception of the discovery of ether is wholly creditable, for its use appears to have spread around the world as fast as the posts could carry the news."

Chloroform.—The third outstanding event in the discovery of anesthesia was Simpson's demonstration of the anesthetic quality and the surgical usefulness of chloroform. This triumph came at the Royal Infirmary at Edinburgh on November 15, 1847. A considerable controversy took place as to whether or not Simpson gave adequate credit for the assistance he had received from others in his introduction of chloroform anesthesia. Clark seems to make a fair summary of the evidence and concludes that Simpson was "somewhat economical in his recognition of the help he received," but that essentially Simpson should get the credit for the introduction of chloroform. He seems also to have been the first to have used anesthesia in labor.

The discoveries of ether and chloroform and nitrous oxide stimulated intensive research into the properties of other potential anesthetic agents. Flourens in 1847 had described the anesthetic action of ethyl chloride as well as of chloroform. Since the workers of the time were unable to find agents which excelled ether or chloroform, much of this research died down. The younger generation accepted those two agents and interest was lost for many years in trying to find new general anesthetic agents. Certainly it could not have been until Dennis Jackson in 1915 had evolved the principles necessary for closed anesthesia that

volatile agents such as nitrous oxide and ethylene, which had long been known, and later cyclopropane, could satisfactorily be used as anesthetic agents Use of closed anesthesia made possible the employment of these and other highly volatile agents Throughout the introduction and development of surgical anesthesia, the demonstrations, in general, were attended by good luck, except for Wells's unhappy experience

Ethylene —Ethylene was discovered in 1795 by four Dutch chemists It has been found to be an extremely versatile compound For example, in 1936 a rough check showed that more than 50 commercial compounds were available from it Its uses extend from an agent to ripen bananas, citrus fruits and bulbs to surgical anesthesia While Hermann, in 1864 anesthetized himself with this agent, it did not come into surgical use until Luckhardt, puzzling as to why carnations closed in certain greenhouses found the agent in natural gas and from this proceeded to study its human anesthetic qualities Brown also studied the agent and published his findings some ten days before Luckhardt and Carter in 1923 Ethylene made it possible to proceed a considerable step further than nitrous oxide, as far as depth of anesthesia is concerned, in conjunction with concentrations of oxygen compatible with life This advance was associated however with a terrible explosibility

Cyclopropane —Cyclopropane was prepared by Freund in 1882 but it was not until 1929 that its anesthetic powers were discovered by Lucas and Henderson These were put into principal use in the clinic by Waters and Rovenstine in 1935 Cyclopropane, in turn, was a considerable advance over ethylene in that it was far more potent and permitted a really adequate supply of oxygen to be used in conjunction with the depth of anesthesia adequate to produce muscular relaxation, even adequate for some abdominal surgery

Divinyl Ether —Examination of the structure of ethyl ether and of ethylene led to the attempt to make a kind of hybrid molecule which, it *was hoped would have a good many characteristics of both parent* agents The synthesis was performed by Major The anesthetic properties were studied by Leake and Chen in 1928 and again by Leake, Knoefel and Guedel in 1933 This agent proved to be rather unstable It is possible that many of the objections to it are associated with breakdown products rather than the original molecule It is potent and rapid in its action

Apparatus for Inhalation Anesthesia

However much one may mistrust equipment as a significant advance, sometimes its development constitutes major progress Two items at least must be included under this heading

The Closed System Dennis E Jackson in 1915 described a method for the production and maintenance of prolonged anesthesia In his system

the subject rebreathed the anesthetic gases or vapors, oxygen was added and carbon dioxide removed Only by such a means did the use of the highly volatile agents like cyclopropane become practicable A high oxygen atmosphere could be maintained and the cost of the whole process kept at a relative low level, since undue loss of the gas could be prevented The Otto Henry Schwartzes, father and son, first utilized Jackson's method on patients and showed that it worked Dr Ralph M Waters and Dr Brian C Sword improved upon and popularized the method

Endotracheal Anesthesia —As Gillespie[5] has recorded, intubation of the trachea as an aid in resuscitation in animals goes back more than four hundred years to Vesalius Of more interest to us at this time is the fact that just about three quarters of a century ago, Friedrich Trendelenburg introduced an endotracheal tube into a man through a tracheotomy opening in order to facilitate an operation on the upper air passages by keeping blood out of the airway This was aided by an inflatable balloon around the tube

Gillespie also has recorded that a Scotsman, William Macewen in 1880 in Glasgow, following experiments on a cadaver, evolved the transoral endotracheal tube similar to the system used today, for use in anesthesia

Non volatile Anesthetic Agents

There are three general uses for these agents First they are desirable in preanesthetic medication, as so called basal* anesthetics, that is, as an agent which is designed to last throughout the time anesthesia is needed and is expected to diminish the quantity of other anesthetic agents needed during this period and, finally, the non volatile anesthetic agents are used to produce full anesthesia Liebreich in 1869 was the first to produce anesthesia with a non volatile agent, chloral hydrate but this method did not become very important until the synthesis of bar biturates, first made possible by the synthesis of barbital by Fischer in 1903 It was not until 1924 that Fredet and Perlis introduced a bar biturate into a vein to produce anesthesia

Before the non volatile anesthetic agents can compete with the volatile agents in controllability and safety for general anesthesia a substance must be found which can be eliminated, perhaps through the kidneys or destroyed perhaps by the liver, in less time than the volatile agents need for excretion through the lungs Perhaps we shall never find such agents Certainly we have not yet discovered them Lacking such extraordinary agents, we are finding uses for the less spectacular agents which we have Historically, the development of tribromoethanol dissolved in amylene hydrate and marketed under the trade name 'Avertin had a consider

* While the famous Russian surgeon Pirogoff used ether by rectum in 1847, it was not until about 1926 that tribromoethanol, a typical basal anesthesia was administered

able period of popularity following its synthesis by Willstatter and Duisberg in 1926 In the four or five years after the creation of this agent several hard lessons were learned One of the principal ones was the fact that the action of non volatile agents once injected into the body could not be reversed with anything like the ease of the widely used inhalation agents It was also learned that great caprice of action must be expected by agents administered by rectal instillation Sometimes satisfactory anesthesia was produced, often it was not And all too often serious toxic effects resulted With the development of barbital and its derivatives the non volatile agents enter into a new phase As the years have gone by since the introduction of these fascinating agents, various short lasting barbiturates have appeared The most popular one of these is thiopental, the sulfur homologue of the popular sedative pentobarbital Short duration of action makes for controllability as long as the toxicity of the agent is not excessive

Local Anesthetics

Topical, Local and Spinal Anesthesia —In 1855, Gaedicke isolated an alkaloid from the leaves of the coca plant (erythroxylin), which was undoubtedly cocaine Several years later (1860) Niemann obtained the alkaloid of coca leaves in pure form and called it cocaine He also noted the numbing effect of this drug on the tongue In the next ten years the historical development is a little obscure, but H Braun recorded, in 1870, that at least two French laryngologists, Fauvel and Sagha, were by that time treating painful conditions of the larynx and pharynx with extracts of coca leaves And in 1878 V Aron Anrep made a careful study of the pharmacologic properties of cocaine Two years later Coupart and Borderan showed that cocaine applied to the conjunctiva abolished the lid reflex

The really effective introduction of local anesthesia into medicine and surgery followed an accident of Koller's in 1884, when he got a little cocaine into his eye and observed its anesthetic effect He then applied the drug in ophthalmology Within six weeks of his report in Heidelberg it was being used in America, chiefly by Halsted who soon learned that he could block the cutaneous branch of the ulnar nerve with the agent From this, the modern development of regional block anesthesia directly grew In the next year, Corning, an American, demonstrated that spinal anesthesia was possible This epoch making discovery took place on October 18, 1885 After a single experiment on a dog, Corning carried out the first spinal anesthesia in man Let him describe it

"As in the case of the dog previously referred to, I was bent upon abolishing reflex action and annulling sensory conduction in the cord To this end I injected thirty minims of a three per cent solution of the hydrochlorate of cocaine into the space situated between the spinous

processes of the eleventh and twelfth dorsal vertebrae As there was no evidence of modified sensibility after the lapse of six or eight minutes, I again injected thirty minims of the solution Ahout ten minutes later the patient complained that his legs 'felt sleepy' The passage of a [urethral] sound, though usually accompanied by considerable pain, remained almost unperceived on the morning succeeding the injections the patient informed me that he bad experienced tingling sensations and numbness in the lower limbs until nightfall The passage of the sound [the following day] was, as formerly, accompanied by some pain Be the destiny of the observation what it may, it has seemed to me, on the whole, worth recording "

In 1900 Bier popularized spinal anesthesia

As important as Koller's introduction of cocaine into clinical medicine was Einhorn's (1899) demonstration that esters of amino benzoic acid have local anesthetic properties when brought into contact with nerves Einhorn's synthesis of procaine ("Novocaine") in 1905 introduced the modern era of local anesthesia

It is important to mention, however, two other important matters which have gone far to make local anesthesia the safe and useful tech nique it is The first was the demonstration by Braun, in 1903, that the addition of epinephrine to certain local anesthetics greatly prolonged their action and the second, the proof by Tatum, in 1925, that soporific drugs, especially barbiturates, used before local anesthesia is produced greatly diminished the toxicity of the local agent employed

In recent years the search has been to find anesthetic agents which can be made synthetically, with low toxicity, which will also anesthetize mucous membranes Great steps were made in this direction when the cocaine molecule was taken to pieces and it was learned that the im portant components are the presence of a piperidine group and a benzoyl group *In recent years, work in this field has taken the direction of* making larger and larger molecules In some instances these are ex tremely toxic The goal has always been, of course, to increase the anesthetic potency out of proportion to the toxic effects While progress is being made, notable advances are not coming so rapidly at present as was the case some years ago

CONCEPTS OF IMPORTANCE

We have seen already and we shall continue to see again and again how any consideration of modern developments and current usages even over the last seventy five years requires many references to the past We have so far described the discovery of anesthesia We shall now take a look at some of the great concepts which have helped us to understand, to develop and to utilize anesthesia They constitute some of the most important advances ever made in the field of anesthesia

The Significance of Partial Pressure

Let us now go back for a little while to a consideration of inhalation anesthesia I have long believed and long taught to my students that there can be no understanding of inhalation anesthesia without an understanding of the concept of partial pressure, not only Dalton's Law of Partial Pressure but the meaning of it in operation For an appreciation of this, we must consider the gas laws Boyle s Law relating volume of gas and pressure (1660), Gay Lussac s and Dalton's (sometimes called Charles s Law) relating volume and temperature 1802 and the concept of absolute temperature, the ' Combined Gas Laws " Avogadro's Hypothesis explicitly Dalton s Law of Partial Pressure and Henry s Law For all of this background it was probably not until Paul Bert really explained the meaning and significance of partial pressure that this background was synthesized for modern use and put brilliantly to work in Haggard s study [6]

The Safe Concentration

The next concept to consider is that of the "Safe Concentration of Ether This grew out of Haggard's work just referred to and may have been first formalized by P Trendelenburg For ether, 0 1 gram per liter of inspired air will if inhaled to the point of equilibrium deliver to the tissues 1 5 grams per liter never more This will produce full anesthesia without serious side effects in normal individuals

The Ideal Anesthetic Agent

In a search along the roadside for the signposts and milestones that mark significant progress it has often been possible, as I have already indicated to attach specific men s names and dates to definite advances Also as we already have seen sometimes the work of many men has led to a concept There is a third type of advance in which the work of many individuals is involved and which represents a recognition by many of a certain need This recognition itself constitutes an advance I should like to mention as an example of this the concept of the ideal anesthetic agent This concept if understood as a pattern of what we need in anesthetic agents will lead to a clear concept not only of what are significant advances in the past but of what we are working toward in the future

Much can be learned as to the characteristics of the ideal anesthetic agent by an orderly examination of the inhalation anesthetics as they have appeared through the years Thus we find that ether, the first agent of great significance and chloroform are potent* agents highly

* Potency can be defined as the reciprocal of the molar concentration in the blood at equilibrium required to produce a given effect

soluble in the blood and in the brain They can be used with a low partial pressure to produce deep anesthesia, an abundance of oxygen therefore can be administered with them Because of their high solubility, ether and chloroform are far less speedily controllable than are agents with a low solubility like nitrous oxide This agent lacks potency for all of its desirable qualities and therefore is extremely limited in its usefulness So much of it is needed to produce what little effects one can with it, there is little room for oxygen in the mixture inspired From these facts it is evident that what is needed is a potent agent of low solubility so that full surgical anesthesia can be produced, plenty of oxygen provided and controllability attained Ethyl chloride with its lower solubility (than ether) and rapidity of action offered an interesting development which was lessened by its toxic effects on the heart Acetylene offered another considerable step in the desired direction, but its terrible explosibility, its frequent serious contamination, its major toxic effect are all overwhelming objections to its use

Ethylene and cyclopropane have already been discussed They are interesting examples of agents of low solubility and, in the latter case considerable potency, attained only at the price of fearful explosibility

To get a well rounded answer to what the ideal anesthetic agent is we need to consider the points of view of a number of individuals the pharmacologist, the anesthetist, the surgeon, the patient, the manufacturer Actually of course there is much overlapping of the interests of each of these and it would be adequate to set down only the criteria of the pharmacologist It may be helpful, however, to consider the points which appeal strongly to each of the above five This does not imply that other points are to be ignored

1 The pharmacologist wants (*a*) a gas or vapor (*b*) The toxicity limited to that inherent in the primary anesthesia process, no secondary reactions No depression of the respiration or circulation within the clinical range of the agent (*c*) Anesthetic strength high enough to produce anesthesia with a partial pressure of not over 650 mm Hg (to allow at least 15 per cent oxygen at 760 mm Hg), in other words anesthetic strength high enough to produce full anesthesia with ample oxygen at atmospheric pressure (*d*) Wide margin of safety between clinical and fatal doses (*e*) Low solubility in order to provide for rapid induction and rapid recovery—for in this lies controllability from one moment to the next (*f*) An agent not inflammable or explosive in air or oxygen

Amplifying points of view are the following

2 The anesthetist stresses safety and adequacy for the task at hand

3 The patient wants a pleasant and swift induction with no irritation and no unpleasant odors He wants a recovery period free from the effects of the agent He puts comfort high in his scale of values—since he does not know enough of the dangers he faces

4 The surgeon wants complete and quick muscular relaxation, no increase in capillary bleeding and a non-explosive agent

5 The manufacturer wants an agent which can be produced simply, inexpensively, is easily purified, stable, so that it remains unchanged during storage and is safely and easily transported [7]

Curiously enough, the only inorganic gas known to possess useful anesthetic properties coming nearest to fulfilling these requirements is nitrous oxide Practically, it falls far short of the ideal because of its lack of anesthetic strength It might seem logical to search for the ideal agent amongst the other nitrogen compounds Unfortunately those known are all too irritating or too toxic to offer hope

Gaseous compounds other than those of carbon are all too toxic, so far as known The hydrocarbons are anesthetically potent, in many cases, yet they are usually accompanied by explosibility or great toxicity or both The search for new anesthetic agents will probably continue in the hydrocarbon series, but in recent years the search has taken a turn from the volatile to the non volatile agents

Mechanisms of Action

In the one hundred and fifty years anesthesia has been known to be possible, it is not surprising that during the course of observation of *what* happened when anesthetic agents were used, questions should arise as to *how* anesthesia could take place While early and abortive attempts to explain the mechanism of action of these agents go back more than a hundred years sound progress although still woefully inadequate, has been made in the last fifty years The size of this problem was clearly grasped by R S Lillie and its importance indicated in a statement he made in 1916 "The problem of the general nature of anesthesia is in fact inseparable from the wider problem of the nature and conditions of irritability in general" Irritability of living tissue and the factors that modify it could be called the central problem of all biology, of life itself As any thoughtful man must realize, ignorance of the nature of the anesthesia process has probably done more to hold back the development of clinical anesthesia than all other factors combined History has shown time after time that effective control of a physiological or a pathological process comes only when we understand the mechanism involved

One had better admit in the beginning that no theory or theories of anesthesia based upon our present vague knowledge of the effect of anesthetics on the central nervous system are adequate to explain the mechanism of action Historically, the principal workers in this field have dealt with simpler systems than that of the complex mammal

One year after the introduction of anesthesia into general clinical medicine, von Bibra and Harless in 1847 formulated the first biochemical theory of anesthesia This had no importance except to call attention to

the role of fats and other lipoids in the action of anesthetic agents In 1866, Hermann suggested that the fat like substances, lecithin and cholesterin, as well as fat were the site of action of anesthetic agents, but it was not until some fifty years ago that the modern lipoid theory of anesthesia was formulated in any precise way This was done independently by H H Meyer (1889–1901) and by E Overton in 1901 The theory which they formulated quite independently but along similar lines is the only one which originated in an attempt to explain anesthesia All of the others have essentially been by products of other work While this is not the place to go into the details of this theory, it and its supporting data indicate that fat solubility is the chief characteristic of the effect of anesthetic substances in the alcohol group It was shown by Meyer and other workers that a sharp parallelism exists between anesthetic strength and the distribution coefficient of the anesthetic agent and that these parallel each other, however, the distribution coefficients might be modified as for example by temperature changes It was concluded that the volatile agents which produce anesthesia are effective to the same degree when they have been dissolved in approximately the same molar concentration in the cell lipoids

The next theory to be mentioned is the so called colloid theory of the action of anesthetics As early as 1860, Binz had foreshadowed the modern colloid theory of anesthesia He saw coagulation of brain cells produced by morphine This work has no importance other than to call attention to the fact that agents which produce stupor, or anesthesia, appear to cause coagulation of cellular material Claude Bernard set down his observations along this same line in 1875 He believed that coagulation produced or accompanied anesthesia and that dispersion or peptization of the particles accompanied recovery Experimental support for this theory is meager Its applicability to anesthesia is quite unproved It does present some interesting problems for future work

The modern view of the action of anesthetic agents goes back about fifty years and properly may be said to begin with the work of Traube, Lillie and Warburg These workers believed that the adsorption of anestbetic agents on the surface of cells was responsible for anesthesia This conclusion was not apparent at the beginning of the work of these men It started in 1904, with Traube's observation that substances which lower the surface tension of water pass more easily through cell membranes than substances which do not exert this effect Here again it must be said that this is not the place to trace the developments which followed this observation and Traube's subsequent belief and evidence that anesthetic strength parallels the ability of a substance to lower surface tension Nor is this the place to describe in detail how Warburg demonstrated in a closed system containing animal charcoal and certain amino acids, that the charcoal will adsorb these amino acids and cause them to be oxidized, and that anesthetics displace the amino acids from

the charcoal surface in predictable amount, and thus prevent oxidation These observations were interesting forerunners of currently held beliefs

A considerable amount of material has been amassed to describe a theory of anesthesia in relation to cell permeability Three names are primarily associated with this Hober, Lillie and Winterstein It appears that Hober was the first to suggest (1907) that adsorbed anesthetic agents decreased the permeability of the cell R S Lillie worked on this during the period 1909–1918 and added fundamental supporting data Lillie's data led him to conclude that anesthetic action depends on "some special sensitive intermediary," in short, the cell membrane This did much to focus attention on the fact that the changes which determine intracellular reaction are surface changes

During these same years Hober, beginning with his work in 1907, was arriving at somewhat similar conclusions, namely, that stimulation is associated with increased permeability of the cell membrane and that anesthetics are those agents which prevent this occurrence Working (principally 1915–1916), Winterstein demonstrated that he could reduce the permeability of tissue membranes with anesthetics

In conclusion, the burden of evidence indicates that the adsorption of anesthetics at cell surfaces or at intracellular structures influences the metabolic activities of the cell, and that the nature of the lipoids present controls to a considerable extent the quality, amount, and site of adsorption Nonetheless, experiment has not shown what specific metabolic activities are affected nor what connection exists between metabolic action and changes in functional activity such as oxidation With his usual sagacity, Cushny sums up the situation "After the anesthetics have penetrated into the brain cell [or perhaps the environment of the brain cell], the effects depend on some other quality which is still unknown" As W Straub put it in his Lane Lectures of 1929, "The problem of painless operations was solved eighty-five years ago, but the problem of anesthesia still remains" On the other hand, it is equally evident from the mass of data available that a promising start has been made, principally in the last fifty years, toward an understanding of the nature of anesthetic agents and the mechanism of their action

SOME INTERRELATIONSHIPS

Psychiatry and Anesthesia's "Second Power"[3]

This matter was discussed in an address on the occasion of the 100th Anniversary of the First Public Demonstration of Surgical Anesthesia Agents that fall into the class of anesthetics have power in addition to their anodyne effects—a power to reveal, to control, and to relieve problems of the mind

The pain relieving power of anesthetics was recognized before the emphasis on the laboratory existed in medicine, psychiatry has become

aware of the mental effects of these agents only in recent years While the power of narcotics and agents we now know of as anesthetics to produce dream like states goes back into antiquity, it was the youthful Sir Humphry Davy[2] who found in 1799 that nitrous oxide had powers to free his mind The "Anaesthetic Revelation" (ether) described by Benjamin Blood in 1874 and the ensuing work on this by William James and others marked a milestone The modern use of "sedative" agents began in the 1920's in the sleep treatment of disturbed individuals The work of Hinsie, Lorenz, Lindemann and more recently Grinker is mentioned in the reference cited

Experimental reproducibility of clinical states is a first requisite in the study of many problems of medicine With anesthetic agents we seem to have a tool for producing and holding at will, and at little risk, different levels of consciousness, a tool that promises to be of great help in studies of mental phenomena Thus, anesthesia, in presenting a reversible depression, enables us to study the life process itself The potentialities for future discoveries in this field seem scarcely to have been tapped

In the biological laboratory, the first rank problems of anesthesia are as fundamental and as difficult as any in medicine The anesthetic process is bound up with irritability, one of the fundamental characteristics of living tissue As mentioned above, Lillie pointed out years ago, the problem of the general nature of anesthesia is inseparable from the wider problem of the nature and conditions of irritability in general Such truths are as cold and remote as the laboratory from human suffering, but as truths they must be broadly applied to these problems if such agents are not only to have power to relieve pain of body but effective power to resolve distress of the mind

The Central Nervous System Depressants in General

It is customary to divide these into the *sedatives* the *hypnotics* (the sleep producers), the *analgesics* (the pain relievers) the *antitussives* (the cough suppressers surely related to the analgesics), the *ego depressants* (agents used in "truth serum," so called), and the *anesthetics* The needlessness of a rigid preservation of these several categories becomes apparent when it is realized that, for example, nothing more than increase in dosage of a barbiturate is adequate to take a patient through this sequence from sedation to anesthesia Techniques for measuring the effects in man of these groups of substances have been evolved in the Anesthesia Laboratory of the Harvard Medical School at the Massachusetts General Hospital[9]

SUMMARY

While anesthesia was introduced into clinical medicine as a significant factor by America, it is evident that great contributions to the develop-

ment of the field have come from many countries in many parts of the world There is no such thing as Chinese opium or British penicillin or American anesthesia [10] Since Adam, suffering is universal; universal, too, are measures for its relief

BIBLIOGRAPHY

1 Clark, A J Aspects of the History of Anaesthetics, Brit Med J, *2*, *1029*, 1938

2 Davy, Humphry *Researches, Chemical and Philosophical Chiefly Concerning Nitrous Oxide, or Dephlogisticated Nitrous Air, and Its Respiration*, Bristol, England, Biggs and Cottle, 1800

3 Lyman, H M *Artificial Anaesthesia and Anaesthetics*, New York, Wood & Co, *p 6*, 1881

4 Anaesthesia in Retrospect, Lancet, October 26, p 611, 1946

5 Gillespie, N A *Endotracheal Anaesthesia*, The University of Wisconsin Press, Madison, p 6 1950,

6 Haggard, H W The Absorption, Distribution, and Elimination of Ethyl Ether, J Biol Chem, *59*, *737*, 1924

7 Seevers, M H and Waters, R M Physiol Rev, *18*, 447, 1938

8 Beecher, H K Anesthesia's Second Power, Science, *105*, 164, 1947

9 ———— Experimental Pharmacology and Measurement of the Subjective Response, Science, *116*, 157, 1952

10 ———— The Relief of Suffering In *The Hospital in Contemporary Life*, Harvard University Press, Cambridge, 1949

MARION B SULZBERGER

VICTOR H WITTEN

2

DERMATOLOGY AND SYPHILOLOGY

By Marion B Sulzberger, M D , F A C P

Professor and Chairman, Department of Dermatology and Syphilology, New York University Post-Graduate Medical School; Director of Dermatology, Skin and Cancer Unit, University Hospital, New York University Bellevue Medical Center, New York, N Y

and

Victor H Witten, M D

Instructor in Clinical Dermatology and Syphilology, New York University Post-Graduate Medical School, Assistant Attending Physician in Dermatology and Syphilology, Skin and Cancer Unit of University Hospital, New York University Post-Graduate Medical School, and Assistant Visiting Dermatologist and Syphilologist, Bellevue Hospital, New York, N Y

> "If I am not mistaken, the time is not distant when diseases of the skin, instead of being esteemed an unimportant, if not repulsive specialty, will be regarded as affording almost unequalled opportunities for the study of morbid processes and when they will take their proper place as introductory to the study of medicine, and before trying to understand diseases which are to a large extent concealed from observation, the student will attempt first to master those which are exposed to view"
>
> Sir Jonathan Hutchinson (1828–1913)

IN ANY era of great and fundamental advances, all branches of medicine participate in the general progress According to the laws of perspective, the eyes of specialists in a particular field are likely to see the achievements in their own specialty loom disproportionately large in relation to the whole and to the advances in more distant fields

But even with allowance for such a specialistic distortion of view, we believe it to be an understatement to say that the specialty of Dermatology and Syphilology has merely kept pace with all other branches of medicine and surgery in their progress during the last seventy-five years

For dermatology and syphilology only began to take on substance as a specialty at the end of the eighteenth century with Willan's and Bateman's writings in England, Alibert's and Biett's works in France and those of Plenck in Vienna And it was not until 1841 to 1844 that Hebra in Vienna, profiting by the problem of endemic scabies on Skoda's medical wards, succeeded in establishing the first separate Hospital Service and University Lectureship for skin diseases Thus the end of the nineteenth century was the beginning of the most productive era of Dermatology and Syphilology

It is during the past seventy five years that in most civilized countries syphilis and gonorrhea have almost disappeared, most cancers of the skin have been checked in their destructive powers, "eczemas" and other allergic, environmental, occupational and drug eruptions have been classified, clarified as to causes and mechanisms and as to means of control, physical, chemical and electrical forces have been harnessed to accomplish the diagnosis and treatment of skin lesions, all forms of radiation, including radioactive isotopes have been applied to skin therapy—and the fundamental laws of their biologic effects have been measured in terms of the reactions of the human skin, innumerable living agents—mites, larvae, insects, plants, fungi, plasmodia, cocci, spirillae, rickettsiæ and viruses—have been recognized as causes of clearly defined skin diseases, and many of these diseases have been mastered by the development of therapeutic agents, applied both from within and from without

When one considers the above list, one realizes immediately that such accomplishments could not conceivably be due to a few schools or a few workers, but must be the composite product of the complementations and confirmations—even the contradictions and polemics—emanating from hosts of workers and hundreds of universities, institutes and hospitals, as well as national and international organizations *

Thus, for example, credit for the present far reaching control of venereal diseases goes not just to a few men such as the discoverers of the spirochete, of arsphenamine, of the complement fixation tests and of penicillin, but also to such well-organized efforts as those of the Venereal Disease Committees of the old League of Nations and of the present United Nations World Health Organizations, the several International Serological Conferences the U S Public Health Service, the statistical studies of the "cooperative clinics" in the United States as well as the

* For reasons which require no explanation to anyone who has ever been so foolhardy as to try to evaluate in print the relative merits of his living colleagues we have deliberately omitted the names of all those dermatologists and syphilologists who are still alive no matter how great we consider their accomplishments Not only to our living colleagues but also to all those great contributors of the past to whose works we have been unable to do justice, we here express our profound admiration and profuse apologies.

venereal disease control workers of the Armed Forces, the public health organizations and the legislative and law enforcement bodies of many nations, states and cities

SYPHILOLOGY

Less than fifty years have elapsed since a German dermatologist and a German parasitologist (Schaudinn) discovered the spirochete of syphilis in 1905, and a short time later in 1906, Landsteiner and Mucha demonstrated it, alive and wiggling under the dark field microscope, while a French dermatologist first stained it in the syphilitic tissues (1906) At about the same period, Metchnikoff and Roux succeeded in the experimental transmission of syphilis to apes (1903) Shortly thereafter in 1904–1907, Albert Neisser at the University of Breslau, and in his own laboratories in Java and Batavia, extended both the animal and human studies, thereby discovering the laws regarding the dissemination of the treponemes and the immunobiologic reactions of the host, as well as establishing the criteria for judging the effectiveness of treatment Neisser was also the first to formulate the distinctions and similarities between yaws and syphilis Almost simultaneously, basing their work on the earlier brilliant serologic discoveries of Bordet and Gengou, Wassermann, Neisser and Bruck in 1906 announced the practical development of the test which has since, under the name of "the Wassermann Reaction," played such a yeoman's part in the case finding and epidemiology of syphilis Three years later Paul von Ehrlich announced the discovery of Salvarsan or "606" and thus ushered in the anti treponemal campaign which now bids fair, not only to stamp out the scourge of syphilis, but also to sound the knell for other widespread and devastating treponemal diseases such as yaws, pinta and bejel It may be of interest here to recall that were it not for the support and the clinical verifications he received from his staunch friends Neisser and J Jadassohn, Ehrlich would probably never have succeeded in introducing the arsphenamines into general use, nor in overcoming the personal, racial and professional attacks which his discovery aroused from certain segments of both the medical and lay public

We cannot here give due credit to the army of workers who now "carried the ball" in every country and every corner of the world However, we must mention the introduction and use of bismuth by Fournier and Guenot in 1921, and the American discovery of the antitreponemal effectiveness of penicillin in 1942 to 1943 This last was of course, one of the most practical of all advances in the fight against syphilis and other treponematoses, for it supplied an easily administered rapid and relatively safe weapon to replace all the older, less rapidly effective and often much more dangerous ones No one who recalls such examples as the paretics in our insane asylums, the pains of tabetic crises, the flapping Charcot joints, the blindness of interstitial keratitis, the miscarriages, the

macerated fetuses and the syphilitic infants, or the bursting aneurisms of syphilitic aortitis—will deny that the march against syphilis will always rank among medicine's most successful fights against one of mankind's most terrible plagues

Also a brief mention should be made of one of the most significant serologic advances since Bordet and Gengou, namely the demonstration of what may be the first specific anti treponemal antibodies to be discovered in the serum of syphilitics, Treponema Pallidum Immobilizing Antibodies (T P I Test) in 1949

RADIATION AND PHYSICAL THERAPY

It is not astonishing that the skin, the organ most exposed to the physical forces of the outer world, should always have afforded auspicious opportunities for the study of the biologic effects of the entire gamut of physical agents, as well as exemplifying their successful applications to the treatment of disease Only a few short months after Roentgen's announcement of his discovery of *x* rays in 1895, Schiff and Freund of Vienna, following the observation of the skin's erythematous reaction to Roentgen's rays, suggested the use of these rays in the treatment of skin disease, the first case so treated was that of a nurse suffering from a hypertrichotic birthmark as well as cancer and tuberculosis (1896) Shortly thereafter, in 1897, Freund introduced epilation with roentgen rays for the treatment of ringworm of the scalp This measure is still the most reliable means of curing certain fungous infections of the scalps of children and adults

From this point on, any account of the advances in the therapeutic uses and the biologic studies of roentgen rays will inevitably include an unbroken series of great dermatological names and dermatologic observations

There followed in quick succession

1 Ullmann of Vienna who introduced *x* rays in the treatment of eczema in 1900

2 The standard mensuration devices introduced by Sabouraud and Noire of France in 1904, the "pastilles" which served for so many years to such good purpose

3 Kienbock in 1907, followed by an important English modification in 1909, perfected a method of *x* ray epilation of the scalp which is still in use today (Kienbock Adamson Technique)

4 At about the same time Pusey and others in the United States, and Sequeira and several other dermatologists in England, pioneered in proving the value of both *x* rays and radium in the treatment of skin cancers

5 The contribution of the New York school of dermatologists and physicists who between 1916 and 1919 perfected the practical system of arithmetical computation of dosage This was the forerunner of the

mensuration system for superficial *x* ray dosage which is in almost uni versal use today

6 In 1949 to 1952, under grants from the U S Atomic Energy Com mission and the Office of Naval Research, follow up studies were carried out on a large series of patients who had been irradiated by these methods from five to twenty three years ago at the New York Skin and Cancer Unit These studies showed that in the hands of qualified specialists in skin diseases the system of mensuration and the adopted dosage limits were both effective and entirely safe

When one recalls not only particular events such as those specified above, but also the vast general experience of our specialty in the field of roentgen therapy, it is not astonishing that the S E D or Skin Ery thema Dose long remained the practical biologic standard of measure ment And it is also understandable why the Parliament of Great Britain, in a quite recent debate on the "Radioactive Substances Bill' officially recognized that Dermatologists had pioneered in this field and that superficial radiation therapy belonged to the specialty of Derma tology "as an honorable and vested right"

Dermatology has contributed not only to advances in the knowledge and use of *x* rays, but also to those in all other forms of radiation therapy For example in 1901, the French dermatologist Besnier attributed the dermatitis which he saw on Becquerel's skin to the effect of the radium Becquerel had carried in his vest pocket, known historically as the "Becquerel burn" Besnier then correlated the known effects of the *x* rays with the inflammatory reactions which Curie and Becquerel had observed with radium, and suggested to these workers that radium be used in therapy Glad to oblige Becquerel then loaned radium for therapeutic studies on skin diseases by Danlos at the 'Hospital St Louis"

In still other fields of radiation therapy, dermatologic observations took the lead Neils R Finsen (1860–1904) of Denmark contributed the first fundamental physiologic studies on the effects of light rays upon the tissues He not only placed the ultraviolet ray treatment of lupus vulgaris and other forms of tuberculosis on a scientific basis but actually devised the first practical lamps for the therapeutic application of these rays

Another dermatologic development which followed was the water cooled lamp which bears the name of its inventor, Krohmayer (1906)

While the above listed contributions have received general recognition, it is not so generally known that as long ago as 1913, two dermatologists in Berne Switzerland employed thorium X (a naturally occurring short half lived *radioactive isotope* of radium) in the treatment of a great variety of skin diseases Modern uses of this radioactive material now include the therapy of certain types of hemangiomas of many itching eruptions, of inflammatory dermatosis such as psoriasis and chronic

eczemas, as well as of keratoses and other growths Another advance in the direction of greater safety and the use of more aptly fitted selected qualities of rays, was made in 1910 when Schultz and S Stern, working independently, applied "over soft" *x* rays to the treatment of the skin But modern therapy with such "super soft rays" really began in 1925, with the first publication on the subject of the "Grenz rays," now also called "Bucky rays "

This by no means exhausts the dermatologic pathfinding in physical therapy The uses of heat and cold in many forms, of halneology, of climate, of massage, of the electrical current for electrolysis, electro coagulation, electrodesiccation and electrofulguration, of physical measures to produce peeling—all these came obviously and naturally to dermatology While the therapeutic freezing of the cutaneous tissues with applications of liquid air was actually first introduced in 1899, "cryotherapy" did not become really practical until 1907, when Pusey first used solid CO_2 snow (' dry ice") in the treatment of skin lesions

This section on physical therapy can be brought to a close by the reminder that it was in the Dermatologic Clinic of Zurich that the characteristic chronologically successive cycles which occur in both the gross and the histologic changes of the *x* ray reaction were first demonstrated in 1925 (Miescher's Waves)

CANCERS AND CARCINOGENESIS

Many an exciting book could be written to recount how dermatologic discoveries and how experimentations on cutaneous tissues have led to advances in the modern knowledge of carcinogenesis, of precancers and of a variety of other tumors But here we can but list the time table of a selected few since 1878

1887 Sir Jonathan Hutchinson described the relationship between arsenic, arsenical keratosis and arsenical cancers

1889 Radcliff Crocker recognized extramammary Paget's disease of the skin

1890 Dubreuilh of France and S Pollitzer of New York independently gave the first descriptions of seborrheic keratoses

1891 S Pollitzer described the disease and recognized both the genetic and oncologic implications of acanthosis nigricans—(implications which are continuing to be explored by many modern investigators including the Columbia University School of Dermatology)

1894 Unna described "Seaman's and Farmer's Skin" as a forerunner of cancer

1896 Dubreuilh coined and discussed the significance of the noun "precancerosis" to describe a lesion *not yet cancerous* but with a high inherent proclivity to turn into cancer

1906 James N Hyde first called attention to the role of light in the production of cancer

1915 Bowen described the precancerous dermatosis which now bears his name

1918 J Jadassohn discovered and described the entity multiple benign superficial epitheliomatosis

1915–1918 Yamagiva and Itchikawa produced the first tar papil lomas and tar cancers in rabbits' ears

1921 Bloch and Dreifuss produced the first regularly reproducible experimental tar cancers in mice, and demonstrated the different cancin ogenic potentials of the different fractions of coal tar (different distillation temperatures, pressures, etc) (These studies served as precursors to the isolation of the first simple chemical carcinogen, Dibenzanthracene, in 1924)

1924 Dr Bloch produced the first experimental *x* ray carcinomas by irradiating rabbits' ears

Finally, it was in the year 1933 that the first virus induced infectious cancers and precancers of the skin of laboratory animals were made available to investigators (Shope Papilloma)

VIRUS

Some of the earliest studies with filtrable virus were performed on the skin by dermatologists between 1878 and 1953

One of the first transmissions of a virus induced tumor was J Jadas sohn s demonstration in 1896 that with the proper technique of *intra epidermal* inoculation, ordinary warts were transmissible in man Nine years later Juliusberg demonstrated the transmissibility of molluscum contagiosum by the same method And two years after this Ciuffo showed that the transmitting agent passed through a bacteria tight filter, *i e* , was by definition a filtrable virus

In 1932 Bruusgaard, the successor of Boeck as Chief of the Dermato logic Institute of Oslo (Christiania) published his classic dissertation on the relationship between varicella and herpes zoster and in the same year Lipschuetz first demonstrated inclusion bodies in a variety of virus in fections of the skin

Some time before this Grueter in 1912 had shown that the virus of herpes simplex could be transmitted to experimental animals by inocu lating the scarified cornea of the rabbit This experiment which was an analogue of the experiment by Paul with the smallpox virus still forms the basis for the simple rapid diagnostic test which rivals the chick-embryo method for proving the presence of herpes simplex virus

Modern dermatologic investigations have proved that the living epi dermal cells offer one of the most suitable and accessible of substrates for viral growth The morphology, immunology and epidemiology of the

virus causing warts, molluscа contagiosa, herpes simplex and zoster, chickenpox and lymphogranuloma venereum and the site and nature of the epidermal inclusion bodies have now been largely elucidated, and the fruits of these studies have shed much light on this modern branch of microbiology It should also be mentioned that the experiments of Heim, of Bonjour (1888) and of Bruno Bloch (1927) in the suggestion treatment of warts and the studies of their recent followers in this field of suggestion and hypnosis, are among the most convincing and best documented investigations in the realm of psychosomatic medicine For these investigations demonstrate in clear cut fashion how psychic influences can play a fundamental role in the cure of an epithelial tumor produced by a virus infection of the skin

MYCOLOGY

We believe that even those with a most superficial interest in dermatology are fully aware of the fact that the science of medical mycology had its origin and owes most of its present knowledge to observations initiated upon the skin and the skin appendages, such as the hair and nails Schoenlein (1790–1864) recognized the Achorion fungi as causing favus of the scalp and hair—and thereby became the first to describe a micro organism as the cause of a human disease Of course, this discovery, which was the origin of medical mycology, somewhat antedates the period of our present review Among the workers of the past seventy five years it is probably David Gruby (1810–1898), a Hungarian physician of Paris, who deserves the greatest credit for initiating mycological advances on a broad front Gruby discovered the fungus in thrush, the ectothrix fungus in ringworm of the beard and the genus microsporon Also he described microsporon Audouini as a cause of ringworm of the scalp in children and endothrix fungi as a cause of other cases of scalp ringworm While these studies of Gruby's were all accomplished between 1841 and 1846 they furnished the starting off place for one who was perhaps the greatest mycologic investigator in medicine, R Sabouraud of Paris Sabouraud placed the subject of ringworm fungi on a scientific and objective basis and added brilliant new investigations of his own In 1890, he made the first pure *in vitro* cultures of several mycological species, described the recognizable features of their growth and correlated the species and their characteristics in culture with the clinical picture of the disease which each particular species produced Sabouraud also first demonstrated the epidermophyton species in the infections of the glabrous skin But even before Sabouraud s main work, Majocchi of Italy had described skin lesions due to actinomyces (1887) Colcott Fox (1848–1916) and Blaxall first described microsporon infections in cats, and in 1895 another English investigator first analyzed in detail the mechanism by which this fungus infects the skin and hair A short while later

T C Gilchrist described American blastomycosis, which still often carries the eponym of "Gilchrist's Disease," and Schenck described sporotrichosis Not very long after this, Arthur Whitfield demonstrated a fungus as the cause of "athlete's foot" There followed a series of modern investigations in which the clinical symptomatology, classification and immunobiology of fungous infections was the subject of literally hundreds of original studies on the part of clinical dermatologists and laboratory workers The routes of dissemination of the fungi, the secondary lesions which they produce in the skin, the immunologic reactions (local and general) and their role in the pathogenesis of trichophytids as described by J Jadassohn, Martenstein, Bruno Bloch and many others, form in their entirety the perfect model experiments for the understanding of the course of tuberculosis, syphilis, leprosy and many other chronic infections, as well as illuminating the whole thesis of focal infections, *i e*, of sterile lesions due to products emanating from distant foci of infection In unbroken sequence these studies have led to the present mycological achievements of dermatology These include the practical development of means of prophylaxis through measures based upon the natural self sterilizing powers of the skin, such as the use of fatty acid powders and other vehicles containing fatty acids in the prevention and treatment of common superficial ringworm of the feet, the better understanding of the origin of some cases of "eczemas" of the hands, and finally to the use of stilbamidine and other stilbene derivatives in the deep fungous infections, such as systemic blastomycosis, histoplasmosis, torulosis and coccidioidomycosis

BACTERIOLOGY

While mycology was naturally the dermatologist's particular field of fruitful investigation, even in other fields of microbiology, studies of the skin have yielded contributions of the first magnitude Almost a century before the beginning of the period we are here describing, the scars of skin lesions on the cow maids' hands led William Jenner to realize that immunity to smallpox could be conferred by previous infection with cow pox, and this in turn led to his epoch making use of deliberate vaccination of the skin It is however, most pertinent to remember that it was Albert Neisser, the dermatologist and syphilologist of Breslau, who in 1879 discovered the gonococcus and that Neisser and Hansen in the same year first stained the lepra bacillus In 1884 Robert Koch was able to fulfill his own postulates and to recover and culture the tubercle bacillus from the skin lesions of lupus vulgaris, to pass this infection on to animals, and to recover the micro organism again from the lesions of these animals. Four years later, Ducrey isolated the bacillus causing chancroid from the pus of a soft chancre, and in 1891 Unna and Ducrey demonstrated this bacillus in the chancroid tissue From this time on the

bacillus has been known as the "streptobacillus of Unna and Ducrey" In 1891, Neisser carried out the first studies of cutaneous diphtheria

Ever since the early studies of Sabouraud, Jadassohn and other dermatologists, pyodermas and the effects of streptococci, staphylococci and other pyogenic organisms upon the skin and skin appendages have formed another fertile field for our specialty These studies have again emphasized the self sterilizing powers of the surface of the skin, the role played therein by the sweat and the natural fatty acids, and by the "drying out" of the surface They have led moreover not only to the development of better general antibacterial agents, including topical antibiotics, but also to topical chemotherapeutic agents such as hexachlorophene In addition to improvements in the management of pyodermas and in the care of the normal skin and hair, the modern improved techniques for "scrubbing up" in surgery and for cleansing the patient's skin before operations rest upon these bacteriologic findings and therapeutic assays on the cutaneous surface

Leprosy is still one of the most devastating of all human diseases in terms of its almost pandemic distribution and destructive capacity The classic studies of Jadassohn and others on the morphology, histopathology, immunology and epidemiology of leprosy, the development of lepromines, of the Mitsuda skin test and of the histamine skin test, and finally the use of sulfones and their careful testing in such leprosoria as those of the Philippines Hawaii, Cuba, Mexico and Louisiana have been another credit to our specialty These last named drugs, sometimes alone and sometimes aided by cortisone and by the new anti tuberculous agents such as streptomycin, para amino salicylic acid and the hydrazide of isonicotinic acid, are now under intensive study by dermatologists

Tuberculosis is a close relative of both leprosy and mycoses, and it is therefore not to be wondered that also in tuberculosis, dermatologic investigations have contributed vastly to general understanding of immunology and management We have previously described how *Koch's Fundamental Experiment* was carried out on the skin of the guinea pig and how the tuberculin skin test helped in epidemiologic and immunologic studies Darier in 1910 discovered and fathomed the mystery of the tuberculids It is a little known fact that while it was in 1890 that Koch first announced to the world the discovery and preparation of his tuberculin, J Jadassohn had already received the precious material for assay two years earlier and had performed the first intradermal tests with tuberculin

Not only in the earlier phases of the seventy five year period we are discussing, but also to the present day, tuberculosis has continued a major field of interest for those specializing in the skin and its diseases Some of the most recent important discoveries in the management of tuberculosis have come simultaneously and independently from Dijon, France, and London, England, with the introduction of the high doses of

vitamin D_2 (Calciferol) in the control of tuberculosis of the skin, and in particular of lupus vulgaris

While it is not easy to decide whether certain achievements should be mentioned under the heading of Bacteriology or of Immunology, we think that it is well here to note the fact that it was Wilhelm Frei of Breslau in 1925 who developed the skin test for lymphogranuloma inguinale, a venereal disease first described in modern terms by two French dermatologists It was this skin test which led to the recognition and synthesis of the protean manifestations of this disease, including the high rectal strictures the elephantiasis and ulcers of the vulva as well as the secondary manifestations of erythema nodosum This unifying concept led to further studies by the modern American and Swedish schools, and finally to the discovery of the virus etiology of the age old disease

While not strictly within the subject of this section it should at least be mentioned in passing that the effects of larger parasites such as mites and insects, have been most extensively investigated by dermatologists Cutaneous observations have led in the development of many new measures for diagnosis, prevention and treatment of so called "parasitic diseases' (*e g*, the first studies of Hebra on scabies, the continuing development of better anti scabietic measures including the modern rapid ones developed by German, English and American investigators) In this general direction of progress lie also the dermatologic contributions to the discovery of better insect repellents, especially those investigated in connection with World War II, such as hexachlorohexane, Rutgers 612, dimethylphthalate and indalone

PATHOLOGY AND HISTOLOGY

It is not mere chance that Hebra and Kaposi were among the great leaders in classifying skin diseases according to objective pathological changes and in setting up the modern systems of dermatology For these men were the disciples and indeed pupils of such pathologists as Rokitansky and Rudolph Virchow Somewhat later Paul G Unna contributed to the advance, not only of dermatology hut of all medicine through his discoveries of new stains for bacteria and his applications of the laws of *histochemical* differentiation Unna s histopathological staining methods were based on his uncanny awareness of the chemical reactions in the tissues His were the earliest efforts to develop specific stains for nuclei for cytoplasm and for intercellular substances It was Unna who first described plasma cells (1891) and the characteristic histopathologic changes of acanthosis and spongiosis who first recognized the derivation of nevus cells at the epidermo dermal junction (Abtropfung) and the 'ballooning and reticular epithelial degeneration found in certain vesicular dermatoses He also demonstrated new characteristics of histologic structures—such as the acid reactions of the nuclei the de

generative reactions in intercellular substance with their shift in pH, the nature of the chemical affinities of the collagen and the nature and role of the substances known as elacin, collacin and collastin It was Unna who together with Tanzer discovered the orcein stain for elastic fibers He also demonstrated the production of lipids during keratinization as well as fatty substances in the secretions of the sweat glands Unna studied the cutaneous fats chemically and differentiated them by spectroscopic analyses! He was probably the first to use digestive enzymes for the differentiation of the various chemical substrates in the tissue structures he was attempting to analyze! While it would be erroneous to state that the science of histopathology has stood still since the time of Unna, it would be entirely unjust not to recognize that many of the fundamental facts upon which we build today were the product of this one man's genius and were discovered by him as far back as 1878 Thus there is hardly a direction of medical thinking which has not received some inspiration from Unna's theories, and scarcely a field of histochemistry, pathology or even therapy which does not today bear the imprint of his achievements

Another great contributor to the virgin field of histochemistry was the dermatologist, Bruno Bloch, who first used a naturally occurring enzyme in the human skin to perform a histochemical analysis of the structures (1917) By supplying a specific substrate to the frozen skin sections, Bloch's "Dopa reaction" not only clarified the process of pigment formation but was perhaps the first demonstration of an active enzyme sharply localized within small granules in the cells

BIOCHEMISTRY, IMMUNOLOGY AND ALLERGY

About seven years after the introduction of tuberculin testing, Jadassohn in 1895 developed the first systematic and scientific means of testing the skin for immunologic responses by means of external application of *simple chemicals* to the skin's surface (today's "patch test") It must be remembered that this was six years before Bordet and Gengou established the principles of complement fixation reactions, seven years before Portier and Richet described anaphylaxis, and eleven years before von Pirquet coined the word "allergy" to designate specifically acquired alterations in the capacity to react From 1895 on, following his use of the patch test, first Jadassohn's school and later many others took the forefront in dermatologic immunologic investigations One year after Darier had given the name "tuberculid" to the distant manifestations of tuberculosis in an immunologically altered skin, J Jadassohn in 1911 coined the word and developed the concept of the "trichophytids" His school, including Lewandowsky, Bruno Bloch, Martenstein and numerous other investigators, then worked out not only the entire immunologic background but also the morphology, routes of dissemination, and other

fundamental laws relating to primary lesions and secondary immunologic manifestations produced in the course of a number of infectious diseases These were studies which led naturally to such developments as the luetin and lepromin tests, Frei "vaccine," etc , and were fundamental for forming a basis of the imunologic concepts of infectious disease Furthermore, Jadassohn and his school, as well as other dermatologic groups, not long thereafter began to lay the groundwork for the immunologic laws governing sensitization to simple chemicals Jadassohn's institution produced the first specific sensitization of laboratory animals to simple chemical substances For it was Wilhelm Frei and his co workers who in 1928 and 1929 succeeded in first sensitizing the skin of guinea pigs to simple chemicals such as arsphenamine, while others reported the successful sensitization of the same species with the fur dye, paraphenylenediamine and with the chemical, phenylhydrazine (Zurich) About this time, pupils of Jadassohn succeeded in producing what to the best of our knowledge were the first deliberate experimental sensitizations of the human skin with simple eczematogenous allergens, namely, orthoform and mesotan (a salicylate) These were quickly followed by successful sensitization to simple chemicals on the part of other dermatologic groups as well as laboratory investigators In 1934 a Danish dermatologist and in 1935 two Russian dermatologists began a series of illuminating studies on the sensitization of the skin with simple chemicals employing dinitrochloro benzene These studies have continued and been expanded by many schools, including several in Switzerland and North and South America The results suggest that the eczematous response in all probability has its basis in the formation of specific antibodies, clearly different from, but quite analagous to specific antibodies responsible for other immunologic changes Dermatologists, notably including those of the Danish and American schools, have also investigated the "fixed drug eruptions," elucidating how much of the specific allergic sensitivity of a tissue resides in the tissue itself and how much must he attributed to factors coming to the allergic site from elsewhere, *e g* , in the form of circulating sub stances Studies using simple synthetic chemicals for skin sensitization, complemented others using simple chemical derivatives of plants and other naturally occurring substances—as in the experiments of Bloch and Steiner Wourlisch in sensitizing guinea pigs to primrose (1930) To gether these were the forerunners of some of the brilliant immunologic work of Landsteiner and co workers, and led to far reaching clarifica tions of many fundamental laws of immunology

OTHER FUNDAMENTAL BIOLOGIC INVESTIGATIONS AND BIOCHEMICAL STUDIES

Studies of disturbance of fat and lipid metabolism were naturally inspired by the dermatologic observations of the xanthomatoses and

related skin diseases While it was in 1878 that Quinquaud submitted the first studies of modern analyses of xanthomas, it was in 1908 that F Pincus and Pick did their fundamental work upon these fatty deposits Thereupon many other dermatologists devoted their attention to the disturbances of fat and lipid formation and deposition in the skin The Vienna school in 1919, Schmidt in 1922 and Urbach in 1923, as well as the Frankfurt school in 1926 submitted illuminating studies classifying the various forms of xanthomatoses and lipid disturbances The results contributed to the separation of primary from secondary xanthomatoses (Vienna, Ann Arbor and elsewhere), together with their different genetic formulas and their different relationships to atherosclerosis of the cardio vascular system While most of these studies had to do with statistical, histopathologic and clinical observations, as well as studies of genetics, it was the work of Schaaf, Bloch and Wohler in the Dermatologic Clinic of Zurich which first brought out clearly the abnormally *labile state of the emulsion of lipids and phospholipids in the sera of patients with certain forms of xanthomatoses* We believe that these studies in 1930 were the first to submit evidence that the *ratios* between the lipid and lipo protein components were the important thing, rather than the absolute amount of such single elements as cholesterol These investigators also produced experimental xanthomas in the skin and other organs of rabbits through deliberately upsetting the fat and lipid ratios by diets, etc

Other important biochemical studies are those pertaining to the skin's sweat and sebum, its pigment and keratin, its enzymes, its electrolytes, nucleoproteins and amino acids, etc Studies of this kind have been going on during the last seventy five years and most intensely during the last two decades and the yield of many of these investigations is beautifully summarized in a book on the physiology of the skin now being published by the University of Chicago School of Dermatology

Still another aspect of cutaneous studies in relation to basic biologic phenomena is to be seen in the contributions concerning the heat regula tory mechanisms of the human body and the role of both secretory and insensible perspirations in producing the necessary dissipation of heat Another large modern chapter concerns the inter relationships between sweat and sebum, and the diseases which are produced both in the skin and in the entire organism when the normal functions of perspiration and the anatomical structures of the sweat glands are altered in any way These studies have experienced a lively upsurge since the time of Julius Schlacter (1923) through the studies of Kreibich in Prague, of the Aus-trian school, and, in America, of the Philadelphia school, the Dart-mouth school and of our own department It has become quite apparent from these studies that not only are the health, pliancy and lubrication of the skin intimately connected with the secretion and delivery of sweat, but indeed the proper functioning and health of the cardiovascular sys-tem, the lungs, the thyroid and pituitary and adrenal glands and of the

entire organism are dependent upon the maintenance of a certain per centage of properly functioning sweat glands

MISCELLANEOUS INVESTIGATIONS AND INVESTIGATIONS OF DISEASES OF UNKNOWN ETIOLOGY

Lupus Erythematosus

This name and disease were scarcely known to general medicine until a few short years ago But to dermatologists they have long been familiar, Biett having first described the entity and Cazenave having given it its present name in 1851 The very early studies, particularly those of Kaposi, recognized that this disease appeared in at least three forms, with transitions between these forms (1) chronic discoid lupus erythematosus, (2) subacute lupus erythematosus, and (3) acute disseminated lupus erythematosus Kaposi in 1872 clearly described the fact that the acute form was a serious, often fatal systemic disease involving many of the viscera, joints, etc It is instructive to note how the early dermatologists, with their poorly developed technical aids to investigation and diagnosis, often made up for these lacks by a high degree of acumen and unusual powers of observation An excellent example of this is evident in the fact that such early clinicians as Hebra, Kaposi and many others had already recognized the fundamental relationships between the torpid, often thick, hard, scarring plaques of discoid lupus erythematosus with their complete absence of impairment of general health and the superficial, erythematous, often evanescent morbilliform and "butterfly" lesions found in young women dying of a febrile systemic disease On superficial examination at least, these skin lesions seem to be so dissimilar that it is a wonder that the clinicians of the past were able to pick up the relationship between these different forms of lupus erythematosus without the help of modern laboratory aids to diagnosis Among these are the inversion of the albumen globulin ratios, the changes in the electrophoretic patterns of the serum, the minute histopathologic changes the accelerated erythrocyte sedimentation rate and other modern laboratory findings which have helped to establish the inter relationships between the various forms of lupus erythematosus A still newer and very significant advance has been added through the recognition of a serum factor producing the "lupus erythematosus phenomenon" by investigators at the Mayo Clinic the Cleveland Clinic (1946) and later at St Louis Missouri This so-called "lupus erythematosus phenomenon" seems likely not only to help in the diagnostic recognition of many cases not formerly considered to be in the category of lupus erythematosus (e g lupus erythematosus without skin changes certain epileptiform seizures etc) but also holds some promise of teaching more about the fundamental nature of the disease and its causes

It should also be mentioned here that the treatment of lupus erythematosus in all of its phases and forms has been steadily improving, beginning with the use of quinine, arsenic and gold salts (Ruete, 1913), going on to the use of bismuth, and now to the introduction of atabrine (first by Russian and later by English investigators) and of chloroquin in the treatment of the chronic forms, and the use of cortisone and ACTH in the subacute and acute varieties It is perhaps not too much to hope that the combined use of some of the newer antibiotic and chemotherapeutic agents, together with cortisone and ACTH may not only prolong but actually save the lives of patients who otherwise would have died from acute disseminated lupus erythematosus

Sarcoidosis

Intensively studied by dermatologists for over fifty years, sarcoidosis is still another example of a disease which has only recently received the recognition and interest of those outside the specialty of dermatology It was Caesar Boeck, Director of the Dermatologic Clinic of Oslo, who in 1899 first gave the classic descriptions of the sarcoid lesions, and it was through the work of Boeck and of Besnier ("Boeck Besnier Disease"), and then of J Jadassohn, Schaumann, Jungling, Martenstein and others, that the disease sarcoidosis came to be recognized in all of its varied manifestations in the lung bones spleen, liver and other viscera and later in the uveal tract, tear glands and parotids (Heerfordt's Disease) While sarcoidosis is still of unknown etiology, the demonstration by Jadassohn, Martenstein and others of that school, that a *relative* skin *anergy* to tuberculin was present in many cases of sarcoidosis, as well as in some cases of mycosis fungoides, Hodgkin s disease, granuloma annulare and a few other conditions shed some light on the sarcoid process Then came the instructive studies of Martenstein and co workers concerning a similar anergy to tuberculin in mules and rats *i e*, in animals quite immune to tuberculous infection Still another step forward was made when workers in the United States (1935), (and shortly thereafter and independently Scandinavian investigators [1941–1933], as well as members of Columbia University's College of Physicians and Surgeons and of the Medical School of the University of Illinois and of our own staff), showed that the cases of sarcoidosis reacted in a characteristic fashion to injections of extracts made from glands and tissues derived from patients with sarcoidosis (the 'Kveim Test' analagous to the Mitsuda lepromin test and the Frei test), and also reacted in a characteristically abnormal fashion to BCG vaccination While all of these findings in their aggregate by no means bespeak the etiologic role of tubercle bacilli in the causation of sarcoidosis, they do suggest that there is an immunologic relationship between whatever causes sarcoidosis and the demonstrated immunologic changes in response to tubercle bacilli and their products

THERAPY

The skin's reactions and diseases are generally the resultants of agents acting upon it from within and the external, environmental forces and substances coming at it from without Similarly the management of skin diseases relies both upon approaches from without (including applications of chemical and physical agents directly to the lesions) and approaches from within (including practically all the chemotherapeutic, antibiotic and endocrinologic agents, the vitamins, drugs and other medicines which are today available for the treatment of any disease) It is therefore obviously impossible to give an encyclopedic résumé of seventy five years full of advances in dermatologic prevention and therapy But to illustrate what we mean, let us take the example of advances in the treatment of just one of the most common dermatoses, *i e*, acne vulgaris

Treatment of acne today consists not only in the local application of keratolytics, of sulfur and resorcin, etc, in the direct irradiation of the lesions with selected forms of radiant energy when necessary, in the external use of astringents and disinfectants, of hot compresses and other physical forces (including peeling with chemicals, with freezing agents and with mechanical means such as wire brushes, burrs and sandpaper), but it also includes the *internal* administration of vitamins such as vitamin A, the giving of endocrinologic preparations—such as the estrogens—to overcome the imbalance in the direction of excessive androgens, the giving of antibiotics as indicated to overcome the infectious element which sometimes plays such a marked though secondary role, the ordering of diets and elimination of drugs, *e g*, iodides and bromides to prevent the accumulation of irritating substances in the occluded follicles of the skin, and every other *conceivable rational measure of environmental control, internal therapy, direct external applications, surgical and other physical procedures*

An analagous type of combined attack from within and without is necessary in the modern treatment of many other skin diseases It would obviously be impossible to credit here each of the hundreds of individual discoverers of therapeutic measures by mention of names and dates It is, however, interesting to note that here again the name of Unna repeatedly appears in relation to signal advances For it was Unna who put external dermatologic treatment on a rational and scientific basis by formulating theories concerning the action of remedies For example, he was the first to speak of the reducing action of sulfur, of ichthyol and of resorcin He also explained for the first time in logical fashion the mechanism of the cooling action of powders and ointments containing water and developed the formulas for the so called evaporating cooling or "cold creams' gave us our first fixed zinc gelatin dressings which still bear his name—Unna's Boot was the first to introduce soaps

containing active medicinal ingredients, and invented and applied the idea of making skin remedies match the color of the skin, by developing topical remedies to which pigments had been added to render them, as he called it, "*Cuticolor*

We have previously mentioned the first use of gold salts in the management of discoid lupus erythematosus where the injection of gold was an established remedy sometime before those interested in arthritis began to use this drug

Moreover dermatologic therapy since 1939 has made use of the sulfonamides in particular our specialty has found excellent use for *sulfapyridine* which today constitutes one of the best remedies in the management of dermatitis herpetiformis

The use of vitamin A in anomalies of cornification and of nicotinic acid in pellagra are among the advances in the management of skin diseases Pellagra often presents itself as a cutaneous disease and has long been an object of dermatologic study, leading to Jadassohn's classic descriptions of pellagra and pseudopellagra One more among the modern uses of vitamins is the management of perleche and blepharitis with riboflavin

The use of podophyllin in the treatment of condylomata acuminata (1944), and the basic studies of the Johns Hopkins school on the effects of this material upon epidermal mitoses is also worthy of record

DDT and the insect repellents developed during World War II aided not only in the prevention of cutaneous damage but also in the prevention of insect vectors inoculating the skin with disease germs such as those of malaria, yellow fever and typhus One other development during World War II which is proving valuable in peace, is the Oxford discovery of BAL (British Anti Lewisite) to counteract the action of the vesicant war gas Lewisite This detoxifying agent has since been shown to be valuable in other forms of arsenical poisoning in mercurial poisoning, and also in combatting the ill effects of bismuth and lastly of chrome (Cleveland school 1943) *The antihistamines and their accomplishments in relieving* such diseases as urticaria and other forms of itching eruptions are worthy of mention

No account of progress can omit some discussion of what many consider to be the most important of all the recent advances, namely, the use of ACTH and particularly of oral cortisone in the management of a great variety of dermatoses ACTH and cortisone properly given may suppress certain skin diseases (such as atopic dermatitis urticaria and exfoliative erythrodermas) and prolong or perhaps actually save the lives of sufferers from previously fatal dermatoses (*e g*, pemphigus and acute disseminated lupus erythematosus)

It is certainly a great therapeutic advance when so many heretofore difficult or intractable diseases can be benefited by a single type of therapy and this same circumstance also justifies the hope for better

experimental approaches and increased understanding of the fundamental nature of the morbid processes involved

One of the latest developments in this field is still too new for final evaluation However, for the sake of completeness we will mention here that the external topical application of *hydrocortisone* has shown promise in controlling the symptoms of a variety of superficial dermatoses *without the risks* which are such grave deterrents to the prolonged systemic administration of ACTH and cortisone

The combinations of these new hormonal approaches with antibiotic, chemotherapeutic and other older measures and the possible usefulness of topical applications of hydrocortisone in conjunction with other local and systemic remedies are matters worthy of the very intensive exploration

RECIPROCAL RELATIONSHIPS

Almost every field of biologic science and every branch of medicine has not only assisted in the progress of dermatology, but has in its turn been enriched and has profited by studies of the skin and its reactions Many other of medicine's proudest accomplishments during the last seventy five years have resulted from studies performed on the skin These include the skin tests with diphtheria toxin and antitoxin (Schick test), skin tests with streptococcic toxin and with innumerable other antigens and toxins used as diagnostic aids in various infections skin tests with "protein" allergens in hay fever, asthma and certain cutaneous diseases, the patch test in industrial and other "eczemas," the immunizing skin infection with BCG and many other great immunologic discoveries Here too one must include the fundamental studies of Sir Thomas Lewis and his school upon the vascular responses of the skin, upon histamine effects and the nociffensor reaction, the investigations of dermatologists such as J Gardner Hopkins and his school and of the University of Chicago group upon responses of the skin to acetylcholine nicotine, etc , and the work of others who have studied in great detail the skin's responses to cold, heat, humidity, etc , and the role of such cutaneous responses to stress in their relation to the health and disease of the entire organism

* * * * *

As we come to the close of this chapter we are keenly aware of its many omissions and imperfections In extenuation we submit that our assignment of summarizing the advances of the specialty of Dermatology and Syphilology during the seventy five greatest years in the history of medicine was one which might well have surpassed the capacities of even the most experienced medical historians

ULRICH R BRYNER

~ 3 ~

GENERAL PRACTICE

By Ulrich R Bryner, M D

President, American Academy of General Practice, 1953–1954
Salt Lake City, Utah

GENERAL practice is both the oldest and newest "specialty" in medicine Even the Hippocratic oath distinguishes between physicians and surgeons "I will not use the knife, not even on sufferers from stone, but will withdraw in favor of such men as are engaged in this work." That such a statement should have been included in the original Hippocratic oath is evidence enough that the medical fraternity has long wrestled with the problem of where to draw the line between the work of the specialist and the function of the general practitioner

This problem has appeared to be an especially knotty one in the twentieth century, which has witnessed an unusually rapid tempo of increase in medical specialization We should recognize, however, that medical specialism is of ancient vintage The Babylonian Code of Hammurabi, as well as the Hippocratic doctrine, takes account of it Probably, if the truth could ever be ascertained by anthropological research, medical specialism of a sort might have been discovered in primitive (preliterate) tribes where there were two medicine men exorcising their demons at opposite ends of the same campsite

To debate between the values of specialism and generalism in medicine —or any other established art or profession of the present day—would be a fruitless, futile and thankless task The answer to the question is as old as Aesop's fable of the camel and the pig, which concluded

Tall is good where tall will do,
Of short again 'tis also true

Specialist and general practitioner are both essential to serve the needs of society for the healing of its ills and the binding up of its wounds The anthropologists tell us that, contrary to popular misapprehension, the world's oldest profession is medicine

There is a middle road between specialism and general practice in modern medicine, which remains an art based upon science We need both well trained general practitioners and broad gauged specialists There is no place, however, for the "epigrammatic types"—that is, specialists who learn more and more about less and less until they know everything about nothing at all, or general practitioners who learn less and less about more and more until at last they know nothing about everything

Practically speaking, however, the young man or woman who today passes through an up to date medical school and internship plus residency in a good teaching hospital to enter upon the general practice of medicine is already better trained in the fundamentals of scientific medicine than were the most advanced medical specialists of a generation or two ago

The last seventy five years have unquestionably provided the most revolutionary changes ever recorded in the history of the practice of medicine Medical practice on every level and practically in every country in the world, has now been affected by these radical improvements in the efficacy of the healing arts The general practice of medicine, or, as it was once designated, "practical medicine," has reflected these spectacular advances in medical efficiency Progress in medicine as a whole in the past seventy five years, roughly since the enunciation and acceptance of Pasteur's germ theory of disease, can be measured by the progress that has been made and the changes that have been effected in the character of general practice

In this chapter we shall briefly review the factors, forces and circumstances which have so radically altered the nature of general practice from what it was when our grandfathers stepped into it At the same time we must remember that some fundamental things have not changed The ethical responsibility of the true physician and his primary concern for the welfare of his patient are no different from what they were seventy five—or twenty five hundred—years ago

The progress wrought in the practice of medicine in the past seventy five years has been brought about by people and events both within and without the medical profession itself The same thing may be said specifically about the character of the general practice of medicine In deed, when all the evidence is reviewed, it may well seem that the physician has been more acted upon than acting in the creation and development of the roles and functions that he now takes in modern society

This fact can be adduced definitively on an international scale, but I shall confine my examples and analyses principally to the American scene, with which I am most familiar Sigerist has pointed out that the role and status of the physician in a given society has always reflected the character of the society in which he practiced In ancient Greece, for example, he was a free man, a priest physician, an Aesclepiad in Imperial Rome, at the heyday of the Roman Empire, he was most likely to be a

Greek slave In modern, democratic, industrialized American society, dependent on experts the physician is (on the average) the highest paid professional and, in general, enjoys a high social status

The factors and forces within the control of the *medical profession* itself which have impinged upon general practice in the past seventy five years may be noted as (1) changes—from degeneration to regeneration—in *medical education* (2) improvement in *medical organization*, and its corollary *medical publication*, and (3) the rapid rise of *medical specialization*

Factors beyond the control and jurisdiction of the profession, which have likewise altered its status and capacity, may be listed as (1) *advances in science* physical and chemical as well as psychological and biological (2) *technological and industrial progress*, particularly in communication and transportation (3) *sociological trends* set in motion by population trends and two world wars and (4) the increasing support first from philanthropy then from industry, then from government of *medical research*

As we trace the chronology of general practice in the United States since the 1880's we can see how these forces and factors have come into play We may properly speak of progress in general practice since this time, but it has not all been smooth sailing and it is full of paradoxes, not always easy to explain There are, for example, statistical paradoxes status paradoxes and therapeutic paradoxes to be discovered by anyone who examines the course of general practice in the United States since the introduction of the teachings of Pasteur and Lister

Here are some of the statistical paradoxes Although the number of physicians in practice in the United States has risen steadily, there are decidedly fewer full time general practitioners today than there were in 1940 or 1880

Here are a pair of status paradoxes (1) The general practitioner has seemingly lost status in the profession but he has gained status in the eyes of the public (2) General practice is praised as the proper path to the effective practice of a medical specialty, but the path is rarely trodden

Here are the therapeutic paradoxes (1) It is often authoritatively proclaimed by leaders in medicine that the general practitioner—the family doctor—'is perfectly competent to take care of 85 per cent of the illnesses to which patients are liable', but in the decade of 1940 to 1950 continuing a long time trend there was a decrease by 13 per cent of the number of general practitioners in the United States and an increase by 63 per cent of the number of specialists (2) The very decade that yielded such a sharp decline in the percentage and number of general practitioners also witnessed the first concerted and organized efforts in many decades to improve the professional status of the general practitioner (3) The diseases which the general practitioner is now therapeutically best

equipped to handle he more rarely sees On the other hand, more weight in diagnosis of disease is now assigned by specialists to those factors of family and social environment which the family doctor is best equipped to assess Some part of his traditional function has sometimes been shunted off to the medical social worker, who has risen in numbers and status

Let us try to understand the significance of these paradoxes, first, the statistical (1) A census in 1880 had developed a figure of 90,000 physicians in the United States, but in 1888 N S Davis, then editor of *The Journal of the American Medical Association*, spoke of "the circle of American associations of specialists, accommodating in the aggregate less than 500 of the 50,000 or 60 000 members of the *regular* medical profession in the United States" The 30,000 or 40,000 "irregular" healers of 1880 could certainly not have been specialists (2) In 1950 the Directory of the Physicians, issued by the American Medical Association, listed 150,417 doctors in active private practice Of this number 54,891 were listed as fulltime specialists, 95,526 in general practice But 22,976 of the general practice group were further designated as giving special attention to one field (3) Hence we had—statistically speaking only, and without reference to quality or ability—about 18,000 fewer fulltime general practitioners in 1950 than in 1880! One may take the more or less speculative point of view that in the light of the relative inefficiency of medical practice in those early days, and the poor transportation facilities a greater bost of general practitioners per capita was needed

A full explanation of the status paradox in which the general practitioner is sometimes caught would require a volume rather than a chapter We can present only the outline of the argument here

The general practitioner is the heir and symbol of the long tradition of the healing arts The picture in the mind's eye—call it a stereotype if you will—that the public retains of the physician is still "the family doctor with his little black bag"—not the specialist with his varied and intricate equipment And despite the decline in the total number of general practitioners, they see more patients than do the specialists Hence the general practitioner is praised (or blamed) for the triumphs of modern medicine in all its aspects Unfortunately, for such is the wayward way of public opinion, he is given credit for things with which he has little to do such as present-day sanitary practice, and blamed for things that are not his fault, such as the increasing costs of hospitalization But by and large, since medicine has become increasingly effective and efficient in the last seventy five years, the general public has come to accord the general practitioner (and the specialist too) greater and greater respect In some instances and areas this has become an almost disconcerting "idolatry of the physician"

Proof of this is on every hand, sometimes distressingly High school students usually vote medicine the vocation they would most like to

enter Cigarette advertisers try to persuade the public that their product is the "doctor's choice" No one objects to being addressed as "Doctor," whether he merits the title or not

We cannot deny that the general practitioner has lost status within the medical profession, at least as compared with the status he held at the turn of the twentieth century Yet there is much evidence, since World War II, that this situation is rapidly changing We shall discuss the new trend toward general practice later in this chapter

The twentieth century decline in the professional status of the general practitioner—a paradoxical trend certainly, for general practitioners have widely extended their range of competence in the same period—is co incident with the rise of "scientific medicine," "laboratory medicine," hospital practice, hospital births, safer surgery and obstetrics, and in creasing medical research

The trends in hospital organization and management during the past fifty years have perhaps contributed more than anything else to the decline of the status of the general practitioner It is difficult today to remember that fifty years ago the hospital did not enjoy its present reputation as a temple of healing More often it was regarded as a charnel house, a place where patients were sent to die Since the surgical spe cialist, more than any one else in the medical profession, required a well equipped hospital in which to perform his vital work, it is not surprising that the surgeons and their organizations—especially the American College of Surgeons—took the lead in improving hospital standards and eventually accrediting them In this process, unquestionably accom panied by ever increasing surgical triumphs, the status of the general practitioner in the hospital began to suffer This was probably in evitable

Also in the process, as has been frequently pointed out in recent years, the hospital itself came gradually to be status centered rather than pa tient centered, a social phenomenon that worked its way up from the laundry to the board of trustees, not excepting the professional staffs This circumstance, by which the general practitioner has suffered, is not inevitable and there is again evidence that rapid changes are in the making For example, the accreditation of hospitals is now in the hands of four organizations the American College of Surgeons (which used to do it alone), the American Medical Association (whose membership is chiefly general practitioners), the American Hospital Association and the American College of Physicians *Even more significant is the fact that* over 35 per cent of the general hospitals in the country now have general practice departments in operation I think we shall soon see many more of them

That general practice should be the gateway to specialized practice has long been admitted, recommended and urged As long ago as 1866, at the annual meeting of the American Medical Association in Baltimore,

the Committee on Medical Ethics, reporting on the advantages and disadvantages of medical specialization, declared that the "disadvantages could be overcome if the specialist would begin as a general practitioner and gradually grow into his specialty" As recently as December, 1952, Dr Louis Bauer, president of the American Medical Association, speaking to its House of Delegates, recommended that all specialty boards should revise their requirements to make experience in general practice a prerequisite to specialty board certification

Whether to specialize or not, and if so, how to go about it most practically and efficiently undoubtedly remains the gravest practical, personal and professional problem that the young man or woman who has completed his undergraduate medical training is called upon to face Surrounded by specialists, he is urged to go into general practice Considering their previous exposure to teaching hospital practice, the wonder is that so many rather than so few still choose general practice

I would be the last to force a decision upon any earnest young man But speaking for myself, and the host of my colleagues in general practice I can only say that it has proved a satisfying and rewarding way of life I am sure from innumerable personal contacts, that many men who enter general practice with the idea of later turning to a specialty nevertheless find general practice so attractive that they abandon their previous intention to become specialists However, as I have noted, this must always be a personal decision Certainly there is nothing a man learns in general practice that will not make him a better specialist if his inclination in that direction outruns his interest in a patient centered general practice

Let us now look behind what I have designated as the therapeutic paradoxes of general practice Here again we can present only the barest outline of the topic To explore it fully would require an encyclopedia of therapy

Certainly a revolution in medical therapy has taken place within the lifetime of most physicians now in practice It can be summed up by saying that pharmacology and materia medica have been retitled "Chemotherapy" Actually the degree of empiricism in the formulation and indications for the use of drugs has been greatly decreased and the realm of specific therapy immeasurably broadened The effect of this chemotherapeutic revolution has been to load the armamentarium of the general practitioner with weapons of healing more powerful and effective than he ever had before and to increase manyfold the efficiency of each general practitioner equipped only with the wide range of knowledge in his head and the little black bag in his hand

Seventy five years ago the number of "specific" drugs available to general practitioners could be counted on the fingers of one hand As late as 1910, according to Keefer, the ten most important drugs in medical practice were (1) ether, (2) morphine, (3) digitalis, (4) diphtheria

antitoxin, (5) smallpox vaccine, (6) iron, (7) quinine, (8) iodine, (9) alcohol and (10) mercury

A similar list of the most important drugs in use, compiled by Fishbein in 1945, reveals the chemotherapeutic revolution in full bloom He lists (1) penicillin, the sulfas and antibiotics, (2) whole blood, blood plasma and blood derivatives, (3) quinacrine and other antimalarial synthetics, (4) ether and other anesthetics, (5) digitalis, (6) arsphenamines, (7) immunizing agents, specific sera and vaccines, (8) insulin and liver extract, (9) hormones and (10) vitamins

Even in the few years since World War II, important new therapeutic weapons have been added to this list We have, for example, many new antibiotics streptomycin, first reported in 1944, Chloromycetin, 1947, polymixin, 1947, Aureomycin, 1948, neomycin, 1949, Terramycin, 1950 We must also note such new drugs as cortisone and ACTH, useful in arthritis and other diseases, anticoagulants, like heparin and Dicumarol, thiouracil and radioactive iodine for the treatment of thyroid disease, BAL (British Anti Lewisite), an antidote for some heavy metal poisoning, para amino benzoic acid, demonstrated to be relatively specific in the treatment of rickettsial invasions, morphine substitutes like methadon, folic acid, and antihistamines (useful despite their introduction as abortives for the common cold)

In the hands of the general practitioner, the new drugs in medicine have universally decreased human suffering and extended the useful span of human life The average life expectancy at birth in the United States as is now well known, has been extended from forty seven years in 1900 to well over sixty five years today But on this score I must include a word of caution the clinician must not hog the credit for this Gerard has recently and pointedly pleaded

"I urge, not only as a matter of justice but also as a matter of enlightened self interest in the long run, that doctors make it clear to the public that the great successes in the conquest of disease—penicillin cortisone, plasmochin—have come from the biological laboratory and not from the practicing physician The poor devils in the laboratories not only deserve and should have credit, but more important, they need the support of the public to keep up their work, to continue to supply the medical profession with ever more effective tools for the practice of medicine'

The specialist is no more to be credited with the genius of the laboratory men than is the general practitioner although the work of the specialties has certainly raised the diagnostic acumen and the therapeutic modalities available today to the general practitioner While this can be demonstrated in all specialties, the fact arises with peculiarly great importance in the areas of psychiatry (and psychosomatic medicine) and physical medicine and rehabilitation In these areas of practice especially, the general practitioner has been given new techniques and

new wisdom which should enable him to take over much of the work that might previously have been wisely left to the specialist alone In the specialties dealing with the extremes of life, pediatrics and geriatrics—newest of the specialties—the general practitioner owes much to the clinical developments in these specialties which enable him to shoulder a considerable proportion of their routine practice

The very success of modern medicine has changed the character of medical practice enormously This fact is sharply reflected in the mortality and morbidity statistics for the past seventy five years In 1900 in the United States for example, the rank order of the principal causes of death was (1) tuberculosis (2) pneumonia, (3) diarrhea and enteritis (4) heart disease and (5) diseases of infancy and malformations

In the past half century, with the victories of medicine and sanitation, the incidence of acute infectious, communicable diseases, whose treatment used to take up a considerable portion of the general practitioner's time and skill has fallen to minor proportions In the United States, indeed, communicable diseases today are responsible for less than 10 per cent of the total mortality Once common communicable diseases have become textbook rarities rarely encountered in general practice

On the other hand with the extension of life span by the conquest, control or elimination of communicable diseases chronic and degenerative diseases, as well as those with important psychogenic components have come to occupy the larger share of the physician's time and attention Paradoxically again these are the diseases which the profession as a whole is less able to alleviate To the extent, however, that the treatment of these diseases requires a continuing attention to regimen, the general practitioner is often in a better position to manage them than the specialist

So much for the paradoxes that surround general practice I want to say just a few words about the factors external to the medical profession which have changed the character of general practice

It has been fashionable to deplore the disappearance of the "family doctor" and to equate him with the general practitioner The "family doctor" has always been with us and will be so long as there are families to seek his services It should be recognized that the character of the American family and its mores have changed considerably in the past seventy five years Up until World War II the American family was growing progressively smaller and the American birth rate was falling Since World War II, the trends are the other way and the demand for the family doctor may therefore be expected to become more insistent

Another important sociological factor which must be considered in tracing the role and status of the family doctor on the American scene is the factor of immigration (to 1924) and internal migration of families within the United States With increasing transportation facilities available, especially the automobile, and with a rapid drift from rural

to urban life, the American people have proved highly mobile Twentieth century families have not taken root in one community as did their nineteenth century forebears Change of residence has been the rule rather than the exception Hence the present day family doctor more rarely gets the chance to become intimately acquainted with a whole family, from grandfather to grandson

I need not comment on the effect that the automobile and the telephone have had on the character of medical practice, particularly general practice Young physicians will not remember what a traveling man the "horse and buggy doctor" was and what a large proportion of his time he actually spent on the road And on very poor roads indeed! Yet he came when he was called, stayed as long as he was needed, and often performed miracles of medicine and surgery with the most primitive equipment on kitchen tables by candle light The saga of general practice in the early days of America is one of pioneering courage, shrewdness and endurance

We are in a new era of medicine today, created in the comparatively short span of seventy five years, one lifetime And after suffering and benefiting by various ups and downs in public and professional regard, general practice is coming into a new, more efficient and more honored role The upsurge has been particularly noticeable since World War II It is evident in medical publications, in medical meetings, in medical organizations, in medical education and, as I have already pointed out, in hospital organization and administration, which is inaugurating more and more general practice departments

Medical education, both undergraduate and postgraduate, is now giving more stress to so called "integrated medicine," which means treating a sick person as a whole rather than cutting him up into organs, organ systems, loci and foci of disease, each to be dealt with by a separate specialist A recent report of the American Medical Association's Council on Medical Education noted that 54 of our 79 medical schools are now sponsoring one or more projects pointed in the direction of "integrated medicine" Perhaps 'practical medicine" would be a better label for these educational activities which emphasize the point of view implicit in the general practice of medicine, namely, treat the patient not the disease alone

From the other end of the spectrum, it is also encouraging to note that "General Practice Clubs" are being voluntarily formed by undergraduate medical students in various institutions At the University of Pennsylvania, the "General Practice Society" numbered nearly 100 students last year

But it is perhaps in the area of medical organization that the role of the general practitioner is now being most strongly emphasized Following Sessions on General Practice and the General Practitioner at its 1942 and 1944 annual meetings, the American Medical Association

created a Section on General Practice in 1944 "Re created" is probably a better description, a the Committee on Practical Medicine had been established at its first annual session in 1848[1]

Equally if not more significant, The American Academy of General Practice was founded in 1947 This organization has provided for general practice the same organizational structure and functions previously operative in the other specialties A unique feature of The American Academy of General Practice is that it requires a prescribed amount of postgraduate study every three years to maintain membership In 1953 more than 400 of the 12,000 members of the Academy were dropped from its rolls for failure to comply with this requirement The Royal College of General Practitioners, established in Great Britain in 1953, and patterned after The American Academy of General Practice, bas adopted a similar principle of continuing postgraduate education for the general practitioner

Bulwarked by scientific, laboratory, hospital and specialized medicine, the trained and retrained general practitioner "around the corner" bas been, is and will more fruitfully than ever continue to be the cornerstone of medical practice throughout tbe world As it has done in the past (I cite the distinguished character of Sydenham to illustrate the point), medicine bas again completed a cycle and come full circle back to recognition of the role of general practitioner as a central figure in the healing art His specialty is the patient—the whole patient and nothing but the patient

BIBLIOGRAPHY

Fishbein, Morris *A History of the American Medical Association, 1847 to 1947* Philadelphia, W B Saunders Co , 1947

Galdston Iago *The Epidemiology of Health, A New York Academy of Medicine Book*, New York and Minneapolis, Health Education Council, 1953

Is There Really a Doctor Shortage? (Debate in print by Frank G Dickinson and Howard Rusk) Med Economics, April, 1951

Keefer, C S Progress in Antibiotic Therapy, Journal Lancet, *57*, 50, 1947

Krusen, F H Treating 'the Whole Man," Hospitals, *27*, 59, 1953

Marriott, H J L *Medical Milestones*, Baltimore, The Williams & Wilkins Co , 1952

Matas, R Surgical Operations Fifty Years Ago, Am J Surgery, Fiftieth Anniversary Issue, 1941 (Reprinted in Am J Surg , *82*, 111, 1951)

Schifferes, Justus J *How to Live Longer*, New York, E P Dutton & Co , Inc , 1949

Solomon, R A Recent Advances in Pharmacology and Therapeutics, J Indiana State Med Assoc , *41*, 800, 1948

DWIGHT L WILBUR

MILLARD H MCLAIN

~ 4 ~

INTERNAL MEDICINE

By Dwigbt L Wilbur, M D
Clinical Professor of Medicine, Stanford University School of Medicine, San Francisco, California

and

Millard H McLain, M D
Department of Medicine, Stanford University School of Medicine, San Francisco, California

SEVENTY FIVE years ago internal medicine hardly existed Identi fication of etiological factors of infectious diseases was then barely begun Control of sepsis following operation was only beginning to bud from the studies of Pasteur and Lister and the accepted knowledge of biochemistry, physiology and pharmacology was largely empirical The outstanding development up to that time was the recognition of a variety of clinical syndromes and diseases, and the description of them that stands today with little change, forms a part of modern internal medicine Some of the most noteworthy delineations of disease came from ability of clinicians of that and earlier periods to elicit symptoms and accurately and carefully perform physical examinations and to correlate these obser vations with those from the autopsy room to deduce the nature of path ologic processes Already Thomas Addison, Richard Bright, John Hunter, John Hodgkins and Thomas Sydenham and many another had recorded their classical accounts of disease entities

In that day the science of medicine hardly existed, and practice was largely of the "art of medicine" Treatment of disease was directed primarily toward the alleviation of symptoms rather than the correction of underlying pathologic processes Purging, bleeding and the use of extracts, tinctures and mixtures of multiple drugs, many of them made from substances now known to have little or no pharmacological action, were the common methods of treatment Sanitation as a way to prevent disease was just beginning to receive attention

In the next twenty five years there was almost unbelievable advance in medicine brought on by an unusual number of medical discoveries and

characterized by the development of scientific methods in approaching the problems of medicine The growth of university medical schools and of the use of experiment in seeking answers to problems greatly accelerated knowledge in bacteriology and pathology and laid the ground work for development in biochemistry, physiology and pharmacology Pasteur was refuting the theory of spontaneous generation of life and establishing the foundation of the germ theory of disease Koch, Klebs and Ebert were carrying on studies of identification of disease producing bacteria Virchow was writing his classical descriptions in pathologic anatomy and establishing theories of pathogenesis

The great developments in medicine during this period were principally in the university medical centers of Germany, France and England Just before the turn of the century scientific methods in medicine came from the European countries to the United States, and here at the same time was introduced a full fledged university medical school, in large part owing to the efforts of William Henry Welch at Johns Hopkins University and Hospital At this time, too, William Osler gave impetus to the re introduction in this country of bedside instruction and of teaching in the wards where students spent most of their time as clinical clerks Bed side teaching and observation correlated with data obtained at the autopsy table and in the laboratory revolutionized medical education, medical practice, and medicine as a whole

DEVELOPMENTS IN THE ETIOLOGY OF DISEASE

Infections

With the advent of bacteriology many diseases were found to be the result of specific bacterial invasion Koch discovered the tubercle bacillus in 1882 and Klebs the diphtheria bacillus the following year By this time Laveran (1880) had already observed the causative plasmodium of malaria Within the next five years the causes of cholera, tetanus, typhoid and Malta fever were identified and in 1905 syphilis, which long had tortured the world, was traced to treponema pallidum The developments in bacteriology were so striking that for a time medical investigators gave little attention to anything else "The voice of pathology," Castiglioni said, "was muted, the clinic was subordinated to the reports of the laboratory and from it issued the standards for the legislator and the hygienist, for the obstetrician as for the dermatologist or pediatrician"

Almost equally important was the demonstration within a few years of the turn of the century of the place of insect vectors in the transmission of disease Sir Ronald Ross demonstrated in 1897 that anopheles mosquitoes transmitted malaria, and three years later the classical studies of Walter Reed and his associates proved clearly that yellow fever was

carried by the mosquito aedes aegypti In 1909, Nicolle demonstrated that typhus was transmitted by the body louse

Soon after bacteriology was born and swiftly grew, other discoveries whose importance was not to be known until much later, were being made In 1892, Ivanovski detected viruses in the mosaic disease of tobacco plants Five years later Loeffler and Frosch noted such organisms in animals with hoof and mouth disease Not until the great strides that came many years afterward in the knowledge of viruses and rickettsiæ as important etiologic factors did virology gradually begin to replace bacteriology as the cynosure of investigation in infectious disease

Degenerative Diseases

Understanding of the underlying causes of degenerative diseases lags far behind achievements in knowledge of infectious diseases Degenerative changes in tissues of mesenchymal origin, particularly those in the walls of arteries, have assumed an important place in modern medicine Knowledge of them has not advanced much beyond the stage of clinical and pathologic descriptions Since diseases of the cardiovascular system of degenerative origin have become the number one cause of death and occur so commonly in patients coming under the care of internists, it is surprising how little is known of etiologic factors How benighted medicine is in this respect is indicated by the fact that it was only slightly more than forty years ago that Herrick in 1912 first differentiated coronary occlusion during life from attacks of angina pectoris

So too with degenerative diseases of the nervous system and of bones and joints They are not adequately understood and knowledge of them goes little beyond the descriptive stage

Neoplasms

Improved methods of recognition of carcinoma and related diseases as well as the increased mean age of the population, are significant factors in the increased reported incidence of malignant tumors The gross morphologic and microscopic characteristics of neoplastic diseases have been recognized for the most part in the last seventy five years, but specific information as to etiologic factors still is almost completely lacking In recent years evidence has accumulated that in experimental animals malignant neoplasms can be initiated by chemical irritants of certain sorts and transmitted from animal to animal, presumably by viruses and by careful selection bred out of certain animal strains Translation of this information to malignant tumors in man is largely premature

Nutritional Diseases

The concept that disease may stem from lack of a food substance essential for health has developed largely within the last forty years Even long after 1795 when the British navy, as a result of observations by James Lind and others, eradicated scurvy by adding an ounce of fresh lemon or lime juice to the daily fare of seagoing personnel, the cause of scurvy, beriberi and rickets still was unknown To Christian Eijkman belongs the credit for instituting investigations which led to the discovery of the vitamins, a discovery which probably did more to revolutionize medicine than any since those of Pasteur Eijkman produced experimentally for the first time dietary deficiency disease and discovered that it could be prevented or cured by administration of a whole cereal grain (rice) This observation was extended to human beings with beriberi who were cured by the use of whole grain rice Others prominent in the early investigations of vitamins included Hopkins, Funk, Osborne and Mendel Mention should also be made of the studies of Whipple, Minot and Murphy in the 1920's which indicated that pernicious anemia and certain other anemias were deficiency diseases

Metabolic Diseases

Von Mering and Minkowski in 1889 noted that a dog that did not have diabetes before pancreatectomy had the disease after the operation Opie in 1901 put forward the theory that diabetes is caused by alteration in the islands of Langerhans, and Banting and Best in 1922 reported the discovery of insulin Clinical application of this information, led in large part by Joslin of Boston, advanced rapidly Similarly, discovery of effective hormones of the pituitary, thyroid, parathyroid and adrenal medulla and cortex and gonads have added greatly to knowledge of etiologic factors of disease

Developments in Diagnosis of Disease

Seventy five years ago diagnosis of disease in all branches of medicine, including internal medicine, was largely by observation of the patient and particularly by history taking and physical examination These methods have never been superseded or displaced but they have been added to greatly and extended by advances in the basic sciences A good example of the value of clinical study of patients in the diagnosis of disease is the demonstration by Fitz in 1886 that "inflammation of the bowels or perityphilitis was usually the result of peritonitis following rupture of the appendix"

The study of living patients and observations in the autopsy room and the clinical laboratory by application of scientific method have been of inestimable value in advancing knowledge In fact, in the last quarter

of the nineteenth century scientific clinicians became essentially pathologists In the great German medical schools and clinics the highest importance was placed on laboratory studies (pathology and bacteriology) and less attention was given to clinical study, especially bedside observation It was shortly after this time that Osler reintroduced bedside teaching as the most important activity in medical training

Chemical and microscopic studies of the urine, blood and other body fluids, secretions or excretions have become routine procedures for all patients Staining and culturing organisms in body fluids in the laboratory have become standard methods of diagnosis of infectious diseases In 1906, August von Wassermann described his serologic test for syphilis Then serologic tests for typhoid, brucellosis coccidioidomycosis and certain forms of streptococcal and viral disease were developed Measurements of levels of dextrose, non protein nitrogen protein and its fractions and of anions and cations such as sodium potassium calcium chloride and bicarbonate have become standard diagnostic procedures in almost all hospitals and in the office of many physicians Numerous chemical tests have been devised by which to evaluate the function of organs such as the liver, kidneys and lungs Estimations of the basal metabolic rate, of the content of protein bound iodine and of minerals or hormonal products in the blood or urine have become recognized diagnostic procedures

Accurate and simple means of determining the arterial and venous blood pressures and circulation time and catheterization of blood vessels with measurements of pressures and of oxygen content and saturation in the blood in various arteries veins and chambers of the heart have proven very useful diagnostic tools Within the last ten years microscopic studies of exfoliated cells in various body cavities have become an extremely useful method of diagnosis The development of various instruments of endoscopy to explore the lumen of hollow organs has greatly extended diagnostic possibilities within the lungs, esophagus stomach and rectum Aspiration of tissue from the bone marrow, liver, spleen and other organs has brought them under closer scrutiny in examination to add further light to diagnosis

Perhaps no diagnostic method of the last seventy five years has caused a greater revolution in medical practice and economics than the discovery of the *x* ray by Roentgen in 1895 The application of this discovery to clinical medicine was rapid and it brought much information concerning the previously "invisible" organs of the living patient Correlation of the findings on photographic films or fluoroscopic screens with those at operation and post mortem examination quickly demonstrated the tremendous usefulness of this method of diagnosis and rapidly established radiology as a separate specialty in medicine The introduction of radio opaque substances into the gastro intestinal tract and bronchial tree and the selective excretion of radio-opaque dyes by the liver into the gall bladder and by the kidneys into the urinary tract completely revolu

tionized diagnostic capabilities of physicians in these fields Introduction of air and occasionally of other contrast media into the cerebral spinal fluid spaces, into serous lined cavities (peritoneum, pleura, pericardium and joints) and, at times, into the retroperitoneal space offered more limited but at times equally important diagnostic aid

Repetition of radiologic examination by these procedures at desired intervals added greatly to understanding of the stages and progress of disease

Equipment and methods for accurate measurement of electrical forces which normally accompany physiologic activity of all living tissues have long been of great diagnostic value to internists The present day electrocardiogram, particularly the vector electrocardiogram, would hardly be recognized by Wilbam Einthoven who developed the string galvanometer in 1903 This method of examination of heart muscle function is invaluable in identifying cardiac arrhythmias, in detecting or confirming the presence of disease of the myocardium which may accompany hypertension, in determining whether there is disease of the coronary arteries, or disturbances of electrolytic balance and nutri tion, in fact in the study of any process which significantly impairs the function of heart muscle Electroencephalograms are helpful in con firming the presence of certain diffuse disturbances in cerebral function and in localizing certain lesions within areas of the brain

In 1931, it was discovered that a number of elements could be made radioactive by exposure to other radioactive materials Among these I^{131} became readily available following the development of atomic piles There is now widespread use of I^{131} in diagnosis of thyroid disease and of radioactive fluorescein in identifying brain tumors Noteworthy is the use of radioactive isotopes in the treatment of disease and of even greater importance is the use of radioactively tagged substances in the study of biological phenomena in living, healthy and diseased tissues While for diagnostic purposes it appears that radioactive materials have definite limitations, the use of them will almost certainly add to what is known regarding physiologic processes and pathogenesis, and perhaps will cause revision of previously accepted theories

ADVANCES IN TREATMENT

The developments in treatment of diseases in the seventy five years from 1878 to 1953 have been as striking as the advances in knowledge of etiological and diagnostic aspects Great epidemics like those that swept the world repeatedly in the Middle Ages and through the nineteenth century no longer occur among civilized peoples A nutritional deficiency state of pronounced degree is rare in the United States, and today a patient with diabetes mellitus or pernicious anemia faces a future of good health and normal life span, albeit one requiring continued treatment

During the same period have come the principal developments of modern aseptic surgery which have permitted surgeons to remove diseased organs and greatly to alter the function of others for cure of disease or alleviation of symptoms

Advances in the treatment of infectious diseases in the earlier part of this period have to do with the development of antitoxins for diphtheria and tetanus Immunology developed almost hand in hand with bacteriology, and as early as 1890 von Behring discovered the possibility of passive immunization of animals and man against tetanus and diphtheria, which led to the concept of antitoxins Prevention of smallpox by vaccination had long since been introduced by Jenner and was followed by attempts at establishing immunity against typhoid, rabies and more recently whooping cough, typhus, cholera and yellow fever

Work toward the development of chemotherapeutic agents, at first looked upon as holding great promise, was surprisingly unproductive except for the remarkable demonstration by Ehrlich in 1910 of the usefulness of salvarsan in the treatment of syphilis More than twenty years later Domagk discovered the therapeutic effect of sulphanilimid and initiated a therapeutic revolution when the sulfonamide compounds were found to be effective against Gram positive cocci Pneumonia, streptococcal, staphylococcal and gonococcal disease, meningococci, meningitis and many urinary tract infections came much more readily under control For the first time man had an active and potent chemical agent in the management of these diseases

Shortly after the first clinical use of sulfonamide drugs came one of the great achievements of medical history Sir Alexander Fleming in 1928 discovered penicillin and Sir Howard Florey in 1938 indicated the clinical usefulness of the substance The development of these antimicrobial agents along with the subsequent developments of streptomycin terramycin, aureomycin and chloramphenicol completely changed the practice of medicine and surgery, the seriousness and mortality of wounds in World War II, the management of syphilis and many other infectious diseases Agents of this sort have been of little or of questionable value thus far in combatting viral infections

Quinine, the standard drug for treatment of malaria throughout the world in the early part of the eighteenth century, maintained this position until the latter part of World War II Then, with necessity as mother, intensive and extensive investigation and research resulted in the production of a number of new effective antimalarial drugs, chief among them atabrine, primaquine and pamaquine Some of them like chloroquine are effective against amoeba histolytica as well

Digitalis preparations have held a high place in the treatment of certain forms of heart disease and heart failure since Withering introduced the drug in the latter half of the eighteenth century Newer preparations of the glycosides of digitalis which may be used parenterally or for rapid

action have been a significant advance In recent years quinidine has been widely used for certain forms of cardiac arrhythmias, and mercurial diuretics have been found to be of great usefulness in controlling the edema of congestive heart failure

Landsteiner's great discovery in 1902 of the four types or groupings of blood laid the foundation for subsequent successful transfusion of blood, for the development of blood banks and for a method of supportive therapy which is basic in much of the success of modern surgical treatment

Studies in metabolism of electrolytes and water have in recent years added much therapeutic information useful in the management of diseases in which edema, loss of body fluids and electrolytes and impaired renal function are prominent features

A proper understanding of the content of an adequate diet has been greatly aided by the identification and subsequent synthesis of the various vitamins The fact that complete proteins were important in the diet and that the gastrointestinal tract played a role in conditioning nutritional deficiency diseases have been of great therapeutic value Along this line the discoveries of Whipple, Minot and Murphy in 1928 of the efficacy of liver in the treatment of pernicious anemia and subsequently the demonstration by Castle of the intrinsic factor of the gastric juice and of a number of other workers of the effective factors in liver extract have been of utmost scientific and practical value

Among the most important and useful medical discoveries has been the unfolding of information concerning the hormones of the glands of internal secretion In 1914 Kendall isolated thyroxin, the active principal of the thyroid gland, and eight years later Banting and Best discovered insulin The therapeutic use of these substances, particularly of insulin in diabetes, has been lifesaving Similarly isolation of the active agents of the adrenal medulla (epinephrine by Abel in 1898), of the posterior pituitary (pitressin by Kamm and his associates in 1928) of the parathyroids (parathormone by Collip in 1924) and of the gonads (androgens and estrogens) in recent years have given clinicians and investigators sharp tools with which to treat and study disease Although not needed as often as insulin for therapeutic purposes, these substances are of inestimable importance in the science and practice of medicine

The discovery of none of these hormones, however, has had the catalytic effect on all medicine that came in the discovery by Hench of the striking therapeutic role of cortisone and of corticotropin (ACTH) in rheumatoid arthritis The importance of the discovery goes far beyond the fact that they are effective agents for the temporary control of this common crippling disease and have therapeutic value in many other conditions these hormones which profoundly affect many fundamental biological processes open new avenues for study of metabolic processes in healthy and diseased tissues

Brief mention has been made of the advances in the surgical treatment of many diseases and of the contributions of this branch of medicine to knowledge of the basic medical sciences Radiology has also rendered great service not only in development of diagnostic methods but also in the management of many neoplastic diseases and some inflammatory conditions The discovery of radium in 1898 by the Curies led rapidly to therapeutic use of this material

In closely related fields, the great strides made in public health and sanitation in the past seventy five years have sweepingly changed the ecologic environment of humans The great plagues of the Middle Ages and up through the nineteenth century have become a thing of the past with the effective control of rats and lice Methods are available for the control of malaria and yellow fever In the United States the latter no longer exists and the former is rare Moreover, malaria, the greatest killer of all diseases in the world, could be wiped out everywhere if modern methods of sanitation could but be universally employed Similarly cholera and typhus, the great epidemic diseases, no longer need be feared by civilized peoples Modern methods to assure the purity of milk and water have added greatly to the control of many diseases of man

For persons as individuals, methods exist by which each may be actively immunized not only to smallpox, but also to typhoid, typhus, yellow fever, whooping cough and tetanus, and passively immunized to diphtheria, measles, infectious hepatitis, mumps and possibly polio myelitis Furthermore, recent discoveries have made it possible chemically to suppress or prevent malaria for long periods It is probable also that serious complications of streptococcal sore throat as rheumatic fever and other non suppurative conditions may be prevented by prompt and adequate treatment with penicillin It appears that recurrences of rheumatic fever may be prevented by long continued use of sulfonamides

SUMMARY

Even quick review of some of the trends and notable events in internal medicine in the last seventy five years is a parade of advances of a magnificent and previously unparalleled order Infectious diseases have been all but conquered and the life span of Americans has been increased from approximately thirty four years in 1878 to sixty seven years in 1953 And those added years in the "last of life for which the first was made' are more healthful than ever they were when Rabbi Ben Ezra spoke of them so glowingly We stand now as we did in 1878 on the threshold of even greater advances in the next seventy five years Perhaps of greatest importance at present is a better understanding of life itself, for wrapped in its present mysteries are the keys to cure of the great disablers and killers of today, degenerative and neoplastic diseases A better understanding of life processes will lead specifically to a better understanding

of and perhaps, therefore, effective measures for control of degenerative disease of the arteries and nervous system and of malignant tumors which so frequently and so seriously alter the being and spirit of man

Perhaps of equal importance is need for achievement of a greater comprehension and understanding of the neurophysiology of man Psychology and psychiatry are in their infancy and, in the age of description, stand much as did internal medicine seventy five years ago Comparable advances in these fields in the next seventy five years would be of much greater benefit to mankind than have been those in medicine in the last seventy five years Man's understanding of man as a person is still in the dark ages Certainly for the time being it remains there despite great advances in the science of medicine

The ultimate goal of medicine is the care of the patient The proper care depends not only on advances in the science of medicine but equally on consideration of the patient as a person No matter how great the advances in the science of medicine in the future, they will be incomplete until the advances in understanding of the psyche of man are equally great While use of the science of medicine may be adequate to care for or cure disease, it cannot suffice for the care of a patient This is still largely an art

One phase of this great problem in the practice of medicine is the increasing economic burden of medical care which comes about in considerable part because of the application to the patient of recent advances in the science of medicine It is up to us as physicians to lead the way in solving this problem as it has been to lead in the development of the science and of the art of medicine

JOHN D FRENCH

5

NEUROLOGICAL SURGERY

By John D French, M D

Chief, Neurosurgery, Veterans Administration Hospital, Long Beach, California, Associate Clinical Professor of Surgery, School of Medicine, University of California at Los Angeles, Los Angeles, California

IN REVIEWING medical history it is impossible to fix upon a definite time when neurological surgery began It is generally considered that this specialized discipline had its inception during the latter part of the nineteenth century and perhaps it did, with apologies to the allied contributions of such basic investigators as Rokitansky, Romberg, John Hunter, Broca, Pare, Vesalius, and a host of other Titans fading back into antiquity Yet during the Victorian era, a few intrepid surgeons began invading electively the sacrosanct nervous system for conditions not associated with trauma or obvious infections The reasons it was possible for them to take this bold step at that time and not before are those underlying the foundations of neurological surgery

William Macewen, successor to Lister as Professor of Surgery at the University of Glasgow, removed a meningioma from a patient in 1879, as did Francesco Durante in 1884, but these tumors were clearly apparent to the outside by virtue of superimposed prominence of the skull In 1884, however, Sir Rickman Godlee removed a tumor that Hughes Bennett had correctly localized by the indications presented in his neurological examination Shortly thereafter (1887), Sir Victor Horsley removed a scarred area of brain which he and Hughlings Jackson had previously predicted to be the cause of epilepsy in the patient The same year Horsley removed a spinal cord tumor, the location of which was established preoperatively by his neurological colleague, William Gowers

Four other names must be mentioned among those of the early pioneers in neurological surgery The Prussian, Ernst von Bergmann, recognizing the importance of asepsis in operative therapy, did much to advance the

treatment of traumatic wounds of the brain His monograph on cerebral surgery (1889) treated this new subject with remarkable clarity and completeness Fedor Krause, a pupil of Volkmanns, devoted his superb surgical skill to the development of operative techniques predicting modern approaches to the Gasserian ganglion and posterior cranial fossa In America, W W Keen of Philadelphia and Robert Weir of New York each removed a brain tumor the same year (1887) and both contributed much to the advancement of early neurological surgery in this country

But it is necessary now to pause and explore the circumstances of the epoch which made it feasible for surgeons to contemplate and accomplish formidable operative procedures on the central nervous system which had been impossible before The answer seems simply to be that enough information had accumulated from many sources to make the procedures feasible and that these pioneers had the intelligence, vision, and ability necessary to put such information to use Thus, it was necessary to know how the nervous system functioned under normal and pathological conditions so that the nature of the disorder affecting it could be localized (the ' where') and decision made as to its amenability to surgical attack (the "what') Additionally, the technical means by which the head and spine could be invaded without the advent of fatal hemorrhage, shock, or infection had to be determined (the ' how') In essence, therefore, the development of neurological surgery as a specialty awaited the maturity of neurology and of general surgery

It would be impossible to mention here even a small part of the physiological anatomical, pathological and clinical observations which at that time had contributed to the development of neurology to the degree that surgical intervention could be entertained in treatment of disorders of the nervous system The investigation of neuromuscular function by Magendie in 1823, Helmholz in 1851, and Brown Sequard in 1857 are cited only as important examples of physiological developments concerning function in the spinal cord Similar examples regarding function of the brain would include the observations of Fritsch and Hitzig in 1870 and of Ferrier in 1873 concerning motor activity induced by cortical stimulation and of Flourens in 1824 on activities subserved by the cerebellum Anatomical contributions were exemplified by Paul Broca's demonstration of a speech center in 1861 and by the description by Betz in 1874 of the pyramidal area in the motor cortex of the brain During this period the development of pathology had reached a peak in the writings of Rokitansky in 1855 and Virchow in 1858

During the pre neurosurgical era, the great schools of neurology were rapidly compiling descriptions of neurological disease, sometimes as a result of developments in the basic sciences, sometimes predicting them The French school, attaining initial preeminence, centered around Charcot and later included such great names as Duchenne, Marie and Déjerine German neurologists were also active, significant contribu-

tions having been made by Romberg, Friedreich, Erb, and Wernicke. Hughlings Jackson headed the group of English neurologists which listed in addition Gowers, Ferrier and Bastian. In America, early leaders in the field were Weir Mitchell, James Putnam and Dercum. This imposing if incomplete, list of names will serve to indicate the feverish activity of the period preceding the advent of definitive surgical attack on the nervous system in the advance of knowledge concerning its structure, function and disease. The "where" and "what" were now beginning to be apparent. Coincident developments in the principles of general surgery indicated the "how."

These fundamental principles of surgical intervention, adherence to which was to become the *sine qua non* of successful operative attack on any region of the body, had become crystallized during this time. They were, as they are now, anesthesia, asepsis, hemostasis, and continuity of tissue.

Before the introduction of the use of anesthetics in operations, it was necessary for surgical procedures to be completed with great rapidity so that suffering could be minimized. This necessity for speed greatly influenced surgical techniques of the time, deliberate dissection by the surgeon, careful hemostasis, the avoidance of shock, and repose of the patient being impossible. As critical importance is now known to attend scrupulous attention to these items of technique in neurosurgical procedures, the appalling difficulties which these early surgeons faced in having to operate on struggling, bleeding patients are clearly apparent. The incalculable advance, then, introduced by the discovery of the anesthetic effects of ether by Long in 1842 and Morton in 1846, and of chloroform by Simpson in 1847 can readily be appreciated.

The incidents leading to the circumvention of another prohibitive obstacle to successful operation on the nervous system have been graphically related by O'Connor and Walker. "There remained the grim spectre which had haunted surgeons from the time of Hippocrates but which was just recognized for the evil spirit it was—suppuration, putrefaction, infection! In hospitals, where patients with infectious fevers, sloughing ulcers and hacking coughs lay alongside recently operated patients, and where surgeons stepped from an autopsy on a septic case to the operating theatre without a change of gown, 'laudable' pus flowed freely from surgical wounds and, invading the blood stream, induced a fatal issue. Following Pasteur's (1860–65) and Koch's (1878) proof of the bacterial origin of putrefaction and the demonstration by Semmelweis (1861) that sepsis could be controlled by hygienic measures, the hospitals got rid of filth and dirty customs which fomented infection. To the genius of Lister (1867) belongs the credit for developing a technique to prevent the bacterial contamination of wounds during a surgical procedure. His concept of antisepsis naturally led to one of asepsis, the principles of which were rapidly formulated by von Bergmann (1891)."

And so, about seventy five years ago, information had been adduced from a multitude of sources which made it possible for the fathers of modern neurological surgery to attack deliberately the central nervous system For the sake of convenience this accrued information bas been classified artificially as that which advanced the science of neurology (*e g*, cerebral localization and function, description of disease, etc) and that which clarified the technological principles of surgical correction of neurological disorders (asepsis, hemostasis, etc) While it will be convenient to discuss at random subsequent advances under these general headings, actually no such dichotomy exists That the early neurosurgeons were aware of this fact is indicated by a statement, quoted by Horrax, of von Bergmann (1889) and echoed by Horsley and later Cushing, "Likewise it has become the duty of us surgeons to concern ourselves with the diseases of the central nervous system much more thoroughly than formerly in order that we may see and learn to treat them in the light of our own judgment

"If the diagnosis as well as the value of operation is left to the internist to decide, then the surgeon sinks to that position of mere bandicraftsman of an earlier epoch " Yet in those days, Horsley bad his Gowers and Jackson, Krause his Oppenheim, and Godlee his Bennett, and coopera tion between neurologist and neurosurgeon remains a valuable association today Information in the 1870's and 1880's was accumulating too fast It was simply impossible for one man to absorb it all, hence arose the necessity for the beginning of specialization in neurosurgery as in all branches of medical science

As a result of the trend toward specialization, medical education and training began to change about this time The curricula of American medical schools, proprietary institutions for the most part where perfunctory training was all too often dispensed, were extended to three and later four years following the earlier lead of European colleges, particularly Scottish, after which they were patterned Aspiring surgeons were seeking training in the great Austrian school founded by Billroth (1829–1894), pathologists were flocking to Germany and Spain, and neurologists to France and England Thus began the change in pre and post graduate education which was to result seventy five years later in the perpetuation of the training of a specialist until he was well along in maturity

From this period of its infancy until its puberty circa 1910, neuro surgery grew at an admirable rate The great texthooks of Oppenheim, and of Gower, and the publications of Charcot and of Babinski documented the tremendous advances in the studies of neurological disorders American neurologists, such as Bernard Sachs and Spiller, attained positions of international eminence The physiological investigations of Pavlov in 1879 on behavior conditioning, of Sherrington in 1895 on reflex mechanisms, of Bechterew in 1885, and of Flechsig in 1876 on pro

jection and association areas of the brain, and of others too numerous to count, exemplify developments in the knowledge of function and structure of the nervous system during this time Improvement in tissue fixing, mounting and staining heralded the classical observations of Golgi in 1883 and of Ramon y Cajal in 1899 from which developed modern neuro pathology Moreover, a momentous and entirely new approach to the study of clinical abnormality was inaugurated with the discovery of *x* rays by Roentgen in 1895

The surgeons during this time had difficulty keeping up with the tremendous advances in other fields which pertained to their efforts to treat neurological disorders In this regard, Sachs has stated "More and more operations for brain tumor were being reported but still the results were poor and the mortality alarmingly high The surgery, prior to 1910, however, was all done by general surgeons, few of them, with the exception of Victor Horsley, with any knowledge of neurology or neuropbysiology" An equally important reason for such poor results, perhaps, was the fact that surgical techniques commonly employed at the time were too rough and gross to be tolerated by the nervous system It remained for William Halsted (c 1890) to correct this deficiency Through his researches in painstaking hemostasis, gentle handling of tissues, local anesthesia, asepsis, blood refusion, and a host of other important problems, he developed an entirely new technique of operative surgery—one admirably suited to the problems pertaining to the operative handling of neurological tissues It is fortunate, if not entirely fortuitous, that the founder of neurological surgery as a specialty, Harvey Cushing, came early under his influence

On his return to Johns Hopkins Hospital in 1901, after a tour of Europe during which he visited Horsley, Sherrington, Kocher, Kronecker, and many others, Cushing had firmly decided upon a career devoted exclusively to neurological surgery His succeeding eleven years at Johns Hopkins were spent in teaching, adapting new surgical techniques to the nervous system, and experimenting or reporting upon such problems as increased intracranial pressure, visual fields, pituitary disorders trigeminal neuralgia, etc Throughout his subsequent career at Harvard and Yale until his death in 1939 he did more than any other man to advance neurological surgery In this regard, Horrax has said, "Indeed if we follow the course of this brilliant and gifted figure during the period of his surgical life work, it will be with the exception of a few though highly important contributions, to follow the development of brain surgery during the first three decades of the twentieth century"

During the early years of the twentieth century other men trained in general surgery were beginning to devote more and more of their time to operations on the nervous system and to contribute to the new specialty Charles Elsberg, who was responsible for so many developments in surgery of the spine and spinal cord, was the founder of the specialty in New

York and for many years its leading figure there Charles Frazier held a similar position in Philadelphia where, with the neurologist Spiller, he was to develop the modern operations of root section for tic douloureux and of chordotomy for painful afflictions of the trunk and lower extremities Thierry de Martel, the founder of neurosurgery in France, worked closely with his friend, Clovis Vincent, a neurologist While he (de Martel) devoted the majority of his time to problems concerning the nervous system, he never lost interest in the more general aspects of surgery

It was undoubtedly during this period that the true specialization of neurological surgery occurred These men, and perhaps others like them in great medical centers of the world, had achieved considerable fame because of their proficiency in handling surgical problems of the nervous system the management of which in others' hands had produced such abysmally poor results Patients from everywhere were referred to these new specialists, expanding pertinent clinical material available to them and increasing their proficiency Moreover, young physicians came to them for training, and the great neurosurgical schools were born just as much earlier, those of general surgery in Vienna, Berlin, and Baltimore had been founded

It is pertinent here to mention the names of two other men, contemporaries of Cushing, Frazier, and Elsberg who entered neurological surgery from neurology rather than from surgery and were to contribute much to it Clovis Vincent, an associate of de Martel's, began performing his own operations late in life yet became a central figure of French neurological surgery Otfrid Foerster of Breslau, tiring of directing the operations of his surgical associates on the nervous system, began to perform them himself A keen observer, his background in neurology and physiology permitted him to make important observations on his patients at operation, expanding considerably existing knowledge of cerebral localization and cutaneous dermatome distribution

Neurological surgery had become established as a specialized discipline, therefore, in the centers mentioned above and a few others during the years adjoining the turn of the twentieth century During the next twenty years, second and third generation neurosurgeons were being trained and establishing centers in other communities all over Europe and America An indication of the extent to which neurological surgery has grown in the United States can be adduced from a comparison of the roster of membership in the first meeting of the Society of Neurological Surgeons in 1920 and of certificate holders of the American Board of Neurological Surgery in 1952 In the former group there were 10, of whom only 7 specialized in neurological surgery, in the latter group there are now well over 400

Thus thirty years ago the operative treatment of neurological disorder had achieved a position of prominence in the field of surgical specialties which position has expanded tremendously since that time It

will be appropriate, therefore, to examine briefly the development of some current neurosurgical practices to demonstrate their evolution in recent years

Surgical Technique

With few exceptions operative positioning and exposures of today are identical or modified versions of those employed or developed by Cushing, Frazier, and others of the early group of neurosurgeons The same statement can be made regarding operative hemostasis, as Horsley's bone wax was available to them Cushing in 1911 devised silver clips for securing cerebral vessels and adapted the electrosurgical unit of Bovie for the coagulation of vessels or for the excision of tumor or brain tissue in 1927 A recent development of considerable value in hemostasis concerns the use of fibrin foam (Ingraham and Bailey, 1944) and of gel foam (Light and Prentice, 1945), substances which have largely replaced the muscle stamps of earlier times The power suction apparatus originally employed by Krause in 1908 but perfected by Cushing (c 1920) has made possible modern techniques of accurate exposure and of wound toilet in cerebral injuries and infections

Anesthetic agents have not changed greatly in recent times, except, perhaps, for the use of intravenous sodium pentothal by many surgeons (c 1942) Methods of administration have improved considerably, however thanks to intratracheal intubation, among other things Novocaine infiltration of skin (de Martel, 1913) is still widely employed Methods of replacement therapy, principally blood transfusions (Lewisohn, 1919), have also improved tremendously making possible maintenance of patients in good condition for long and difficult operations

Diagnostic Procedures

The lumbar puncture, first performed by Corning in 1885, popularized by Quincke in 1891, and employed in tests to determine the presence of subarachnoid block by Queckenstedt in 1916 and Ayer in 1922, is extensively used today both therapeutically and diagnostically Perhaps the greatest advances of aid to the surgeon in diagnosis have been in the field of contrast radiography Dandy's contribution of showing that the ventricular system could be filled with air by injection through trephine openings in the skull (1918) or through a needle placed into the lumbar cistern (1919) offered for the first time a method of confirming a diagnostic impression He also advocated air injection to visualize spinal cord disorders (1922) but myelography employing the injection of such contrast substances as lipiodol (Sicard and Forestier, 1922), and later pantopaque (Steinhausen *et al*, 1942), into the spinal subarachnoid space has replaced its use in most clinics Another dramatic advance in diagnostic radiography came in 1931 when Egas Moniz of Portugal reported

the successful radiographic visualization of the cerebrovascular tree upon the intracarotid injection of thorotrast The radioactive substance employed by Moniz has been replaced by diodrast (Gross, 1941) in most clinics but the applications of the procedure continue to expand steadily

Newer diagnostic procedures employing radioisotopes, iodofluorescine (Moore *et al*, 1948) and phosphorus (Silverstone and Solomon, 1948) have shown considerable promise, but their wide application in the practice of neurological surgeons has been limited because of the large amount of specialized equipment and technical assistance involved

The work of Berger in perfecting the electroencephalograph (1929) yielded another agent of potential diagnostic aid to the neurosurgeon The practical applications of its use, however, have been advanced by Adrian in 1935, the Bibbses and Lennox in 1937, Jasper in 1941, Walter in 1936 and many others, particularly with regard to its use in evaluating and treating the epilepsies and in localizing cerebral masses The electromyogram originally described by Piper in 1912, but perfected by Adrian in 1925 has also been helpful in diagnosis, particularly of lesions of the spinal cord or peripheral nerves

Neurosurgical Procedures

Pathology —The definitive treatment of central nervous system neoplasms has been inestimably advanced by pathological determinations of the nature of these growths Much of this information was presented in a series of monumental monographs of which that of Cushing on the pituitary body (1912) of Bailey and Cushing on the gliomas (1926), and of Cushing and Eisenhardt on the meningiomas (1938) are classical examples As a result of these and a host of other works, it has been possible to predict resectability and prognosis, and to determine radiosensitivity Principal new growths susceptible to X irradiation are pituitary adenomas and medulloblastomas and these tumors are commonly treated radiologically today

Tumors —The technique of modern operative surgery is surprisingly similar to that employed in Cushing's time In 1915, the operative mortality from published cases of brain tumor by leading surgeons of the preceding era was 40 to 50 per cent A review of Cushing's cases at the time showed an operative mortality of 8 4 per cent, a model of perfection worthy of emulation today In isolated instances improvements have been made Cushing's operation for acoustic neuromas, for example, merely gutted the tumor, leaving the capsule In 1922, Dandy began completely excising the growths and the results of the operation in the hands of Olivecrona, Cairns, Horrax and Poppen, and many others have been better than the less complete procedure of Cushing

The results of operations for spinal cord tumors in the second and third decades of the century, as described by Frazier and by Elsberg,

were extremely good If improvements have been made, explanation is certainly not difficult when the advantages of advances in diagnostic procedures, antibiotics, and vastly superior rehabilitation facilities available today are examined Such advantages have made it possible for surgeons to explore the possibility of more radical excision of intra medullary spinal cord tumors, even to the point of complete excision

Intervertebral Disk Protrusion —A newly recognized and extremely common symptom-complex, about which volumes have been written, is that produced by protrusion of the intervertebral disk The true nature of this disorder was described by Mixter and Barr in 1934, the tumor like nodules having been considered "chondromas" or "echondroses" before The results of surgical removal of these displaced nodules in the lower lumbar and cervical regions are good

Vascular Anomalies —The advent of angiography and other technological improvements have made it possible today to attack successfully vascular lesions of the brain many of which were considered inoperable in the past Saccular aneurysms are undoubtedly the most common developmental abnormalities of the cerebrovascular system attacked surgically today While the presence of these lesions was diagnosed during life as long ago as 1875, definitive treatment has only been undertaken relatively recently The first large series of cases surgically treated was reported in a monograph by Dandy in 1944, and in this account, 70 per cent of the patients were said to be cured Since then, experiences with the treatment of this disorder have been related by Hamby, Poppen, and many others with opinion somewhat divided as to whether the lesions should be attacked intracranially or indirectly by means of ligating the carotid artery in the neck Perhaps there would be general agreement to the statement that surgical intervention should be considered in all cases but that the attack employed should be dictated by the circumstances surrounding each lesion The same statement would probably hold regarding the treatment of carotid cavernous fistulae although experience with carotid artery ligation is of longer standing in this condition, the first such procedure having been reported in 1808 by Cooper Excision of angiomatous malformations of the hemispheres is still a formidable procedure although by no means impossible as thought to be by Cushing twenty five years ago

Abscesses —Since the first important monograph on the drainage of cerebral abscesses by Macewen in 1893, many procedures have been advocated including marsupialization (King, 1924) and repeated aspiration (Dandy, 1926) Clovis Vincent in 1936 prefacing modern management of the condition, accomplished excision of abscesses a remarkable achievement for the days before chemotherapy The subsequent discoveries of antibiotics by Domagk, by Fleming and Florey, and by Waksman have tremendously aided in the treatment of these infections—as they

bave for others involving the nervous system—rendering their excision simpler and safer.

Injuries.—The experiences of neurosurgeons during World War I resulted in considerable improvement in the treatment of cranio-cerebral, spinal, and peripheral nerve injuries. Still further advance occurred during World War II, due largely to rapid communications, replacement therapy, antibiotics and improved techniques. The principles of debridement are not dissimilar to those in existence for decades, although primary closure of wounds and the avoidance of infection have markedly diminished posttraumatic seizures in patients with head wounds, and enligbtened nursing care has minimized complications in patients with injuries of the spinal cord. The indications for surgical intervention following closed head injuries remain unchanged and decision for operation on patients with closed injuries of the spine is dictated by conditions of the individual case. The use of skeletal traction by means of Crutchfield tongs (1938) applied to the head represents a considerable improvement in treatment of cervical spine injuries. A similar advance in plastic repair of cranial defects bas attended the use of metallic plates.

The effects of injury to peripheral nerves have been known for hundreds of years but were particularly well described by Mitchell, Morehouse and Keen on tbe basis of their experience during the Civil War Attempts at surgical repair, however, met with indifferent success until after World War I, experiences to that time being reviewed in Stookey's monograph published in 1922. Subsequent improvement, particularly during World War II has resulted from improved technological facilities, newer methods of combating infection, advance in information concerning nerve regeneration and in tbe principles of early anastomosis without tension. The problems of nerve substitution and grafting are still under investigation although encouraging functional results have been described following the former procedure, particularly in connection with injuries of the facial nerve

Pain.—Operative attacks against pain have been performed throughout the history of modern neurosurgery Tbe early Gasserian ganglion resections for trigeminal neuralgia were replaced by division of the sensory root of the nerve through a temporal operative exposure described by Spiller and Frazier in 1901 and from a suboccipital approach by Dandy in 1925. Sjöqvist in 1937 advocated an operation in which the tract of the nerve was divided in the medulla oblongata thereby preserving sensation in the face, but occasionally this procedure was followed by unfortunate side effects. Cortical resection of appropriate portions of the sensory cortex to relieve phantom pain which frequently follows amputation (de Gutierrez-Mahoney, 1942) has been reported, but to date the results are inconclusive.

The division of the spinothalamic tracts for painful afflictions below tbe pectoral girdle was first advocated by Spiller and accomplished by Martin

in 1911 Although appropriate division of posterior spinal roots (rhizotomy) has been performed for similar disturbances, tractotomy remains the operation of choice today The latter procedure has been modified by Schwartz and O'Leary in 1942 to include its application in treatment of painful conditions of the upper extremities

Psychosurgery

The operation upon the brain, known as lobotomy, performed in patients with mental disorders was first described by Egas Moniz in 1935 The purpose of the procedure was to isolate the pre frontal associational cortex from its thalamic nuclei and modifications have been developed subsequently by operations on the cortex (Pool, 1949, Scoville, 1949) association pathways (Freeman and Watts, 1936, Lyerly, 1939), and thalamus (Spiegel and Wycis, 1948) Remarkable improvement has resulted following the procedures in patients suffering from certain psychotic, psychological, and painful states and evaluation of results continues in an effort to determine the operation which affords maximum benefit with minimum intellectual impairment

Epilepsy —Resection of irritative foci continues to be the principle of the operative treatment of patients with epileptic seizures as it was when first described by Horsley and Jackson in 1886 Tremendous advances have occurred in the effectiveness of this operation through improved knowledge concerning cerebral localization, surgical technique, aids to diagnosis, and medical treatment These advances have resulted from the interest in the problem of Penfield (1934), Sachs (1935), Walker (1947), and many others Penfield and Erickson estimated in 1941 that 40 to 45 per cent of patients with excision of epileptogenic foci were either cured or markedly benefited and their sustained interest in the problem continues

Congenital Anomalies —Modern operations for hydrocephalus have included destruction of the choroid plexus (Dandy, 1918 Sachs, 1942 Putnam, 1934), opening of the third ventricle (Mixter, 1923) and drainage of the subarachnoid space or ventricular system into a body cavity or viscus (Heile, 1927, Matson, 1949) The last mentioned operation seems to offer the most favorable outlook in the treatment of this condition, recent successes having followed in particular drainage of fluid into the ureter (Matson, 1949) Plastic repair of cranial and spinal defects (meningocele, etc) and operations for craniostenosis are performed commonly, results depending upon the degree to which the condition has permanently handicapped the individual

Dyskinesias —A variety of procedures has been advocated in attempts to eliminate abnormal uncontrollable motor movements, yet continued interest and controversy in the problem indicate the limitations of the operations The efficacy of cortical resection for choreo-athetosis has

been explored by Bucy and Buchanan in 1932, Sachs in 1932, and Klemme in 1942, opinion differing as to whether the affected member need be paralyzed to eliminate the dyskinesia Division of long motor tracts in the peduncles (Walker, 1949) and high cervical region (Putnam, 1938) have been described Surgical attack on the extrapyramidal system in the basal ganglia (Meyers, 1940) and spinal cord (Putnam, 1933) have also been investigated It appears that more information must be developed regarding the structure and function of motor systems before this problem can be resolved

Autonomic Nervous System —The voluminous and controversial literature on surgery of the autonomic nervous system precludes more than mere mention here of the fact that resections of the sympathetic chain of varying extent are being done primarily for spastic and occlusive disease of visceral and somatic vessels as well as for various disorders of visceral pain

SUMMARY

An attempt has been made here to review briefly the circumstances leading to the development of neurological surgery as a specialty and to examine the evolution through the years of some of the more common problems with which it deals as evidence of its progress The critical deficiency of such a limited review must he in the omission of major contributions—some original, some corroborative, some critical—to advancement of the specialty, particularly by early disciples in its formative years Furthermore, it does not express the debt modern neurosurgery owes to tireless teaching and training afforded younger men by founders of the numerous centers of development throughout the world Fortunately, the job has been done more completely and with greater authority in recent histories by Fulton (1946), Walker (1951), Sachs (1952) and Horrax (1952), and it is a pleasure to acknowledge the liberal use which has been made of these excellent volumes in the preparation of this report

BIBLIOGRAPHY

1 Bailey, P , and Cushing, H *A Classification of the Tumors of the Glioma Group on a Histogenetic Basis with a Correlated Study of Prognosis*, Philadelphia, J B Lippincott Co , 1926

2 Castiglioni, A *A History of Medicine*, New York, Alfred A Knopf, 1947

3 Dandy, W E *Intracranial Arterial Aneurysms*, Ithaca, N Y , Comstock Publishing Co , Inc , 1944

4 Elsberg, C A Mount Sinai in the Late Nineties and the Beginning of Neurosurgery in the Hospital, J Mt Sinai Hosp , *4*, 430, 1938

5 Fulton, J F *Physiology of the Nervous System*, London, Oxford University Press, 1938

6 ———— *Harvey Cushing, A Biography*, Springfield, Illinois, Charles C Thomas, 1946

7 Horrax, G *Neurosurgery—An Historical Sketch*, Springfield, Illinois, Charles C Thomas, 1952
8 Harris, H *California Medical History*, San Francisco, J W Stacey, Inc, 1932
9 Matas, R *William Stewart Halsted, 1852–1922 An Appreciation* (In Halsted, W S Surgical Papers, p xv–xviii) Baltimore, The Johns Hopkins Press, 1924
10 Penfield, W Neurosurgery Yesterday, Today and Tomorrow, J Neurosurg, *6*, 6, 1949
11 Sachs, E *The History and Development of Neurological Surgery*, New York, Paul B Hoeber, Inc, 1952
12 Stookey, B Early Neurosurgery in New York Its Origin in Neurology and General Surgery, Bull Hist Med, *26*, 330, 1952
13 Viets, H R Fifty Years of Medical Progress Medicine as a Science Neurology, New England J Med, *244*, 400, 1951
14 Walker, A E *A History of Neurological Surgery*, Baltimore, The Williams & Wilkins Co, 1951

NICHOLSON J EASTMAN

6

OBSTETRICS AND GYNECOLOGY

By Nicholson J Eastman, M D

Professor of Obstetrics, The Johns Hopkins University School of Medicine Baltimore, Maryland

OBSTETRICS

THE last seventy five years bridge a period between two eras of obstetrics as far apart as was medieval civilization from modern In 1878, childbearing was a hazardous undertaking and any substantial deviation from the normal physiologic processes meant death Cesarean section was too dangerous to think of, blood transfusion was non-existent and childbed fever was a general and fatal scourge Today, in the United States, less than 2 mothers die per 1000 deliveries, and with the extension of available facilities even this low rate could be further reduced This achievement stems from the interaction of many factors and from advancement in various fields The more noteworthy of these are as follows

Prenatal Care

Seventy five years ago the physician was summoned for the first time only after labor had started Attention to expectant mothers during pregnancy, or prenatal care, may be regarded as "preventive obstetrics" and as is true of preventive medicine in general, has been one of the great lifesaving agencies of modern times Indeed, it is probably the most important single advance in obstetrics during the past century Prenatal care is of American genesis and was first conceived and introduced by the nursing profession It had its beginning in 1901 when the Instructive Nursing Association in Boston began to pay antenatal visits to some of the expectant mothers who were to be delivered at the Boston Lying In Hospital This work gradually spread until in 1906 all these women,

prior to confinement, were paid at least one visit by a nurse from the Association By 1912, this Association was making about three antenatal visits to each patient Thus began the general movement for prenatal care which has probably done more to save mothers' lives in our time than any other single factor

The past two decades have seen widespread expansion in facilities for prenatal care, particularly in rural areas As an example the work of the Maryland State Department of Health may be cited No less than fifty five prenatal clinics are in operation at key points throughout the state, instructions are given to expectant mothers in regard to hygiene, diet, danger signals, and so on, and arrangements are made for competent assistance at deliveries Patients presenting any abnormalities are carefully screened for referral to well staffed and completely equipped obstetric clinics for expert care, and, furthermore, a full time obstetrician is available twenty four hours a day for consultation in the event of emergencies Largely as the result of this program, the maternal mortality rate in the counties of Maryland (excluding Baltimore City) has fallen from 60 maternal deaths per 10 000 live births in 1933 to 10 in 1948

Similar programs are in operation in other states, with comparable results They are a great credit to the respective state health departments and to the United States Children's Bureau which has sponsored them The latter organization, through its emphasis on high standards of maternity care its support of educational programs, its development of obstetric facilities in rural areas and its grants in aid for federal and state cooperation in maternal welfare, has played a most important role in providing both better facilities and better personnel

Hospital Delivery

Seventy five years ago almost all babies were born in the home To day, the vast majority of deliveries in the United States takes place in hospitals The greatest increase in the percentage of hospital deliveries has occurred during recent years Thus in 1935, 37 per cent of the live births occurred in hospitals, in 1941, 51 per cent, while in 1946 the percentage had risen to 82 4 In cities of over 100,000, and in twenty states over 95 per cent of the births take place in hospitals The multiple safeguards which delivery in a good hospital affords, especially in emergencies cannot be questioned, and this trend alone has undoubtedly accounted for the saving of many maternal lives

Educational Programs

The *sine qua non* of good work in any field is well trained personnel The dramatic fall in the maternal death rate which this country has experienced over the past fifteen years is attributable in large measure to a far flung network of thoroughly trained obstetricians and nurses This

army of workers did not develop by chance but was the purposeful and far-sighted creation of various agencies intent on meeting the needs of maternity care. The American Board of Obstetrics and Gynecology has been especially instrumental in this advance. Although without legal authority, this is the generally endorsed body which certifies specialists in this field. The standards it has set are high and candidates are certified only after rigorous written and oral examinations. The 2500-odd specialists whom the Board has certified have not only established high levels of obstetric care in their own practice, but by example and precept have provided tutelage of high caliber for thousands of medical students, interns and residents.

Postgraduate courses in obstetrics designed especially for general practitioners have been held in such profusion throughout the country that there is scarcely a practitioner who has not had the opportunity of receiving instruction in his own vicinity if he so desired—and the attendance records show that tens of thousands of them have so desired.

A unique type of postgraduate instruction for specialists and general practitioners alike was developed by Philip F. Williams in the early thirties—the maternal mortality conference. Begun in Philadelphia, these conferences are now being held in many of our large cities at regular intervals, usually under the sponsorship of the local medical society. They comprise searching analyses of all maternal deaths occurring in a given city, especially from the viewpoint of preventability.

Blood Transfusion and Obstetric Hemorrhage

Modern blood transfusion ranks with prenatal care as one of the paramount advances in obstetrics of all times. Although the procedure became theoretically feasible after the blood groups had been discovered by Landsteiner in 1900, several decades elapsed before transfusions were used liberally in obstetrics. With the introduction of blood banks, the incidence of transfusion in patients suffering from all types of obstetric hemorrhage has increased greatly. Massive transfusions of 5,000 cc. and more in the presence of desperate blood loss (abdominal pregnancy, uterine rupture) are now made possible by large blood stores with the result that countless mothers have been spared. Beyond question, the liberal use of blood transcends all other advances which have ever been made in the management of obstetric hemorrhage.

In 1932, Moir of London published the first of a series of studies which have served not only to revolutionize our concept of the pharmacology of ergot, but have culminated in the isolation of a new and most active principle of the fungus, ergonovine. Next to silver nitrate, ergonovine is probably the most extensively used drug in obstetrics and has contributed greatly to the over-all postpartum blood loss in labor. Another valuable oxytocic agent, extract of posterior pituitary, was introduced for the

treatment of postpartum hemorrhage by Blair Bell in 1908 In 1928, Kamm and his associates separated two fractions from posterior pituitary extract One possesses marked oxytocic activity, and is usually referred to by the trade name "Pitocin" The other is strongly vasopressor and antidiuretic, and is usually referred to by the trade name "Pitressin" Since one of the most common and serious complications of pregnancy and labor is a condition characterized by hypertension and water retention the toxemias of pregnancy, the vasopressor and antidiuretic fraction of whole pituitary extract is undesirable for obstetric use and hence Pitocin constitutes a valuable addition to our armamentarium The intravenous administration of Pitocin by the continuous drip technique, as introduced in this country by Hellman, is one of the most efficacious means of stemming postpartum hemorrhage and deserves wider employment for this purpose than it has received

Although uterine tamponade has long been regarded as a lifesaving necessity whenever postpartum hemorrhage approximates 1000 cc, the present tendency is to abandon it in favor of bimanual compression of the uterus Although this procedure was described by Hamilton in 1861 and has enjoyed wide use in England and Europe, it has received scant attention in this country It consists simply of massage of the posterior aspect of the uterus with the abdominal hand and massage of the anterior uterine aspect with the other fist, the latter being rotated in such a manner that the knuckles rub against the uterine wall this provides not only twice the amount of uterine stimulation that can be accomplished with abdominal massage alone but by compression of the venous sinuses of the uterus, allows the organ to contract on these vessels more effectively than would otherwise be possible

The more liberal use of cesarean section in placenta previa, together with adequate blood transfusion, has reduced the maternal mortality from this complication from more than 10 per cent to less than 1 per cent Until recent years there has been general agreement that placenta previa demands prompt delivery and that temporizing for any purpose is rarely if ever, indicated As the result of the important observations of Herman Johnson, Macafee T Tiffany Williams, and others it is now clear that a waiting policy is justifiable in certain cases, in order to minimize the high neonatal mortality which is levied by prematurity in this complication In suitable cases this temporizing policy has reduced the neonatal mortality due to prematurity

In regard to abruptio placentae, several advances, some theoretical and others practical, deserve comment In certain cases of abruptio placentae characteristic lesions occur in the uterine wall, which serve to explain not only the mode of origin of the separation, but also the failure of the organ to contract after being emptied of its contents The uterus, and occasionally the tubes and ovaries as well, take on a bluish, purplish, coppery coloration and resemble an ovarian cyst with a twisted pedicle in appear

ance This has been called the utero placental apoplexy of Couvelaire after the French obstetrician who first described the condition in 1912 From a practical viewpoint, the management of this complication has veered towards cesarean section although opinion is not unanimous on this question Blood transfusion is probably a more important factor in the outcome of any given case than is the method chosen for delivery

Puerperal Infection

The elucidation of the cause and prevention of puerperal infection by Semmelweiss, and most of the publications of Lister on antisepsis, preceded, of course, the period here under consideration The achievements of the past seventy five years in this sphere have been the practical application of the principles which those two immortals of medicine established A skeptical profession was slow to accept the recommendations of Semmelweiss and only following the investigations on puerperal infection of J J Bishoff of Basle, Switzerland, in the 1870's was a beginning made in the way of endorsement Thereafter, carbolic washings of the hands and carbolic acid impregnated dressings became widely employed and very soon many obstetrical clinics were able to report substantial series of cases without a maternal death But several decades had to elapse and many new techniques had to evolve before the modern aseptic era of obstetrics was reached Among these new techniques were rubber gloves, steam sterilization of instruments and drapes caps and masks, rectal examinations, and the isolation of infected cases

But even more necessary for the conquest of puerperal infection than these techniques was a thorough knowledge of the bacteriology of the disease The streptococcus was first demonstrated in the lochia of women suffering from puerperal infection by Pasteur in 1880 The other common organisms responsible for the condition were isolated within the next few decades Of special importance was the classic article of Schottmuller in 1910 which stressed the important role played by the anaerobic streptococcus in puerperal infection Prior to his publication these organisms had always been regarded as harmless saprophytes Subsequent investigation has shown them to be the most common cause of puerperal infection

Throughout the early decades of the century one of the most debated questions in obstetrics was this does puerperal infection represent an endogenous or an exogenous process? It turned out that it could be either The most common organism responsible for exogenous infection is the hemolytic streptococcus, this bacterium is responsible for most fulminating cases and for most epidemics It is never a normal inhabitant of the birth canal and, when present, has invariably been brought there by the attendants usually in the form of droplet infection The most common organism responsible for endogenous infection is

the anaerobic streptococcus This bacterium is responsible for the great majority of cases of puerperal infection and also for most fatal cases, but the clinical course is slower than in hemolytic streptococcal infections being usually in the form of a pelvic thrombophlebitis It is a normal inhabitant of the vagina, but rarely becomes pathogenic except in the presence of traumatized tissue

These simple facts about the bacteriology of puerperal infection led to clinical sequelae of the utmost importance Since the hemolytic streptococcus is always of exogenous origin, rigid aseptic technique had well nigh eliminated it as a cause of the disease by 1935 that is, before the sulfonamides and antibiotics were introduced Since the anaerobic streptococcus is only pathogenic in the presence of traumatized tissue, a reduction in traumatic obstetrics during the twenties and thirties resulted in a substantial decrease in these infections, but they still remained a menace

The prompt bacteriocidal action of the sulfonamides on the hemolytic streptococcus proved lifesaving in many cases of infected criminal abortion since most cases of this kind are caused by that organism But by 1935 hemolytic streptococcal infections following term deliveries had become few in number due to the prophylactic measures already described and the need for the drug was correspondingly reduced For the treatment of puerperal infection in general the sulfonamides proved disappointing because they exerted no effect whatsoever on the anaerobic streptococcus The fact that penicillin and aureomycin kill most strains of the anaerobic streptococcus in addition to other organisms, has been an enormous boon in the management of these conditions and is rapidly making death from puerperal infection a rare event

Cesarean Section

Throughout the greater part of the nineteenth century, cesarean section was the most fatal of surgical procedures In Great Britain and Ireland, the maternal mortality from the operation had mounted in 1865 to the appalling figure of 85 per cent In Paris, during the ninety years ending in 1876, not a single successful cesarean section had been performed As late as 1887, Harris noted that cesarean section was actually more successful when performed by the patient herself, or when the abdomen was ripped open by the horn of an infuriated bull He collected 9 such cases from the literature with 5 recoveries, and contrasted these with 12 cesarean sections performed in New York City during the same period, with only 1 recovery In the face of such results it is not surprising that many obstetricians of the nineteenth century doubted the wisdom of ever resorting to cesarean section and predicted that the operation would shortly lapse into desuetude

The turning point in the evolution of cesarean section was the appearance in 1882 of a monograph by Max Sanger, then a twenty eight year old assistant of Credé in the University Clinic at Leipzig It was the purpose of this monograph to recommend the routine employment of carefully placed uterine sutures in cesarean section Within a few years uterine suture was generally recognized as an indispensable part of cesarean section and forthwith the modern operation came into being

Until well into the nineteenth century it was felt that the most favorable time for performing cesarean section was at the end of the first stage of labor, an attitude prompted by the belief that the hemorrhage incident to incising the uterus would be minimized if the uterine muscle was in a very active state of contraction In view of this doctrine, cesarean section remained an operation of last resort As the result of this false concept the general tendency to postpone cesarean section until late in labor, the mortality from the operation remained tragically high until the third decade of the present century Only then did the long reiterated teachings of the proponents of early cesarean section, such as J Whitridge Williams, take effect with the result that the mortality rate fell, in most centers at least, to a figure under 5 per cent The gradual realization that death from peritonitis increased in proportion to the hours of labor preceding cesarean section, and the corollary that cesarean section to be safe must be done early in labor, or before the onset of labor, must be recognized as one of the most important advances in connection with the operation

This restriction on the time at which abdominal delivery could be effected with relative safety, however, proved a great handicap in the practical management of pelvic contraction when tests of labor seemed desirable The introduction of low cervical cesarean section to meet this situation, is one of the great landmarks of progress in obstetrics Although the principle of the operation was first described by Osiandor in 1805, it was not introduced and popularized in this country until the 1920 s as the result of the combined efforts of Alfred C Beck and the late Joseph B DeLee Provided the patient was not actually febrile from intrapartum infection, the low flap operation made it possible to effect abdominal delivery at any time in labor with relative safety

The present day mortality from cesarean section has fallen to an unbelievably low figure and many clinics are able to report a thousand or more consecutive operations without a single maternal death Indeed, any figure in excess of 1 per cent is regarded as reprehensible These gratifying results are due in part to the ready availability of blood transfusion, in part to antibiotics in part to the advantages of the low cervical operation, and in part to various ancillary factors, such as better anesthesia, improved operating techniques and the more judicious selection of cases

in this direction was the employment of the Wassermann test routinely in pregnant women, as initiated in the teens of the century Then followed the routine treatment of all syphilitic pregnant women with arsenic and bismuth with the result that infant loss from this disease dropped dramatically More recently the treatment of syphilis in pregnancy has been revolutionized as the result of the introduction of penicillin and this disease is now an almost negligible cause of infant loss

Analgesia and Anesthesia

At the turn of the century the only type of pain relief employed in obstetrics was chloroform or ether administered at the moment of delivery, and only a small minority of parturients enjoyed this boon During the ensuing half century intense interest has developed in this subject and countless types of analgesia and anesthesia have been recommended

'Twilight sleep," as produced by scopolamine and morphine, was introduced in 1902 by Steinbuckel who reported that the hypodermic injection of scopolamine and morphine practically annulled the pains of labor In 1907, Gauss reported its administration in 1000 cases in Freiburg, and stated that by a proper regulation of dosage 80 per cent would pass into a semiconscious state, which he designated as "twilight sleep " This program, designed to produce amnesia of everything which transpires in labor, was the forerunner of all modern amnesic regimens such as various combinations of scopolamine with barbiturates or Demerol Perhaps some 60 per cent of labors in which pain relief is used today are conducted under some form of barbiturate or Demerol medication in association with scopolamine Although these regimens have been criticized on the grounds that they may narcotize the baby and produce apnea at birth, statistical studies would seem to indicate that mature babies are not harmed by these drugs

The last decade has witnessed notable advances in the development of regional anesthesia in obstetrics in the forms of local infiltration anesthesia, spinal anesthesia and caudal anesthesia Local infiltration anesthesia has found its chief usefulness in blocking the pudendal nerve for vaginal delivery and in anesthetizing the abdominal wall for the performance of cesarean section The transcendent value of this technique lies in its safety, and with gentleness and care most patients can be delivered by this technique with little pain Low dosage hyperbaric spinal anesthesia, known generally as "saddle block anesthesia," is one of the most popular forms of pain relief for delivery in the United States today

The narcotic gases, nitrous oxide, ethylene and cyclopropane which are of low toxicity and provide rapid relief of pain are widely used in current obstetrical practice Nitrous oxide is frequently employed in

As a still further measure to combat peritonitis following cesarean section, the extraperitoneal operation as developed particularly by Waters and Norton has gained vogue during the last decade, especially in cases presenting outright evidence of infection The antibiotics have proved so successful in many of these infected patients that the place of extraperitoneal cesarean section in obstetrics is at present a moot question

Eclampsia

During the first two decades of this century, when the maternal mortality from eclampsia ranged between 25 and 30 per cent, the cause of half the deaths was obstetric trauma, either in the form of accouchement force or cesarean section The realization that convulsing patients are best managed by letting the pregnancy alone and treating the convulsions with certain medicinal regimens constitutes the most important advance in this disease during the present century Although many new types of conservative treatment have been recommended, the exact type used seems to make little difference provided no attempt is made to terminate the pregnancy in the presence of convulsions and coma

In regard to preeclampsia the most noteworthy advances over the past seventy five years have been regular and frequent blood pressure estimations during the latter weeks of pregnancy, regular weighing of the patient over the same period and curtailment of weight gain, especially the use of a low salt diet In 1921, Zangemeister observed that the eclamptic state was usually preceded by a rapid increase in the body weight, he reasoned that this was due to an accumulation of water in the tissues and concluded that the immediate cause of eclamptic convulsions was cerebral edema with resultant increase in intracranial pressure He showed that the normal gravida gains about a pound a week, but that in preeclampsia the gain may be as high as 2 pounds a day The effect of large doses of sodium chloride on the water balance of the body is well known since even in a normal, nonpregnant individual, an increased intake of salt causes water retention The great affinity for salt which the tissues seem to show in preeclampsia has dictated one of our most rational means of treating this disease, namely, the withholding of salt from the diet

Syphilis

Before the institution of efficient prenatal care, syphilis constituted the most frequent single cause of fetal death In 1915, Williams reported that it was responsible for 26 4 per cent of the 705 prenatal deaths occurring in 10,000 consecutive labors One of the most outstanding advances of obstetrics of the present century has been the prenatal recognition and treatment of syphilitic pregnant women The first step

in this direction was the employment of the Wassermann test routinely in pregnant women, as initiated in the teens of the century Then followed the routine treatment of all syphilitic pregnant women with arsenic and bismuth with the result that infant loss from this disease dropped dramatically More recently the treatment of syphilis in pregnancy has been revolutionized as the result of the introduction of penicillin and this disease is now an almost negligible cause of infant loss

Analgesia and Anesthesia

At the turn of the century the only type of pain relief employed in obstetrics was chloroform or ether administered at the moment of delivery, and only a small minority of parturients enjoyed this boon During the ensuing half century intense interest has developed in this subject and countless types of analgesia and anesthesia have been recommended

"Twilight sleep," as produced by scopolamine and morphine, was introduced in 1902 by Steinbuckel who reported that the hypodermic injection of scopolamine and morphine practically annulled the pains of labor In 1907, Gauss reported its administration in 1000 cases in Freiburg, and stated that by a proper regulation of dosage 80 per cent would pass into a semiconscious state, which he designated as "twilight sleep' This program, designed to produce amnesia of everything which transpires in labor, was the forerunner of all modern amnesic regimens, such as various combinations of scopolamine with barbiturates or Demerol Perhaps some 60 per cent of labors in which pain relief is used today are conducted under some form of barbiturate or Demerol medication in association with scopolamine Although these regimens have been criticized on the grounds that they may narcotize the baby and produce apnea at birth, statistical studies would seem to indicate that mature babies are not harmed by these drugs

The last decade has witnessed notable advances in the development of regional anesthesia in obstetrics in the forms of local infiltration anesthesia, spinal anesthesia and caudal anesthesia Local infiltration anesthesia has found its chief usefulness in blocking the pudendal nerve for vaginal delivery and in anesthetizing the abdominal wall for the performance of cesarean section The transcendent value of this technique lies in its safety, and with gentleness and care, most patients can be delivered by this technique with little pain Low dosage hyperbaric spinal anesthesia, known generally as "saddle block anesthesia,' is one of the most popular forms of pain relief for delivery in the United States today

The narcotic gases nitrous oxide, ethylene and cyclopropane which are of low toxicity and provide rapid relief of pain are widely used in current obstetrical practice Nitrous oxide is frequently employed in

combination with ether and in this form constitutes probably the most widely employed method of anesthesia for delivery, especially operative delivery On the other hand, the past decade has seen a swing in many centers to so called "physiological" or "natural" childbirth based on prenatal education to eliminate fear, exercises in relaxation, muscle control and breathing, direct management in labor and, at delivery, encouragement of properly co ordinated muscular effort with minimal anesthesia

The past seventy five years have witnessed many other advances in obstetrics but probably none of the magnitude of those described During this period the whole field of endocrinology in relation to obstetrics has evolved and has contributed much to our knowledge of the physiology of pregnancy and labor The hormone tests for pregnancy constitute perhaps the most widely used practical contribution of endocrinology *X* ray pelvimetry has augmented greatly our knowledge of pelvic anatomy and has proved a valuable adjunct in the management of pelvic con traction The discovery of the Rh factor and its significance has revolu tionized the whole field of blood transfusion, especially in relation to obstetrics, and has served to explain the etiology of hemolytic disease of the newborn Finally, episiotomy has become almost routine in the delivery of primigravida and has doubtless exerted far reaching effects in the prevention of perineal relaxation, in addition to shortening the second stage

GYNECOLOGY

Modern gynecology is a product almost entirely of the past seventy five years In speaking of his book, *The Principles and Practices of Gynecology*, published in 1879, Thomas Addis Emmet wrote "It was published, unfortunately, just before the full development or adoption of the aseptic treatment as applied to abdominal surgery" In other words, *the principles and application of the aseptic techniques, which are pre* requisite to successful operative gynecology, were just gaining acceptance seventy five years ago As late as 1878, Lawson Tait was scoffing at Listerian methods and in that year reported 50 cases of oophorectomy in which antisepsis was utterly ignored but with 19 deaths, mostly from peritonitis Peritonitis itself was but poorly understood until 1880, when T Gaillard Thomas clearly identified so called 'cellulitis" as peritonitis

With the general employment of antiseptic and aseptic techniques operative gynecology, along with abdominal surgery, had its real begin ning and the next few decades brought forth reports of countless new operative procedures The first conditions attacked were naturally those which were most urgent such as ruptured ectopic pregnancy The progenitor of surgery in ectopic pregnancy was the great British gyne cologist, Lawson Tait, who first operated for the condition in 1883 Strides were so rapid that in 1891 Schauta demonstrated that prompt

operation in ectopic pregnancy had reduced the mortality from 86 9 to 5 7 per cent With the advent of modern blood transfusion the mortality rate fell still lower

Hysterectomy had its beginning in the epic struggle with myomata Throughout the greater part of the nineteenth century, vast quantities of ergot were taken by myoma victims in the futile hope that blood loss from these tumors could be stemmed in that way Although a few abdominal hysterectomies had been performed in the first half of the century, the mortality was extremely high because of hemorrhage and sepsis from the thick pedicle In 1889 a general surgeon, Lewis A Stimson first suggested and practiced the systematic ligation of the ovarian and uterine artery trunks as the cardinal principle of hysterectomy This transformed the operation, which has since enjoyed many refinements in technique Wertheim's radical operation for cervical cancer was reported in 1906, and after a period of disfavor, has just recently, with various modifications, returned to popularity in certain clinics The surgery of uterine prolapse, of cystocele and of rectocele is entirely a development of the past seventy five years Likewise, the whole field of female urology was uncovered as the result of the invention of the air cystoscope by Howard A Kelly in 1894

Surpassing these developments in operative gynecology in basic importance, if not in practical utility, are the vast array of advances made in our knowledge of ovarian function, of the menstrual cycle and of gynecological pathology, which are also products of the past seventy five years *Prior* to that period it was believed that ovulation and menstrual bleeding occurred simultaneously The histological approach to this problem by various German investigators in the early decades of the century indicated clearly that a very definite relation does exist between menstruation and ovulation, but that they do not occur synchronously Ovulation occurs in the intermenstrual period the exact dates probably varying in different women, but falling usually between the fifth and fourteenth day of the cycle Menstruation cannot occur without a preceding ovulation although women often ovulate when not menstruating The important role of the corpus luteum in menstruation was demonstrated by the experimental studies of Fraenkel in 1910 Of paramount importance to this whole problem was the epic making monograph by Hitschmann and Adler published in 1908 on the histological changes which the endometrium undergoes during the menstrual cycle The true nature of the sexual cycle in lower animals as described by Heape around the turn of the century, and the introduction of the smear technique for the study of this phenomenon by Stockart and Papanicolaou in 1917 proved invaluable tools for the study of female endocrinology This discipline was further developed by the chemical isolation of the estrogenic hormone by Edward Allen and Doisy during the twenties and of progesterone by Corner and Willard Allen in the thirties The whole domain of gyneco

logical pathology has also been created during the period under consideration, largely as the result of studies of the great German pathologist, Robert Meyer.

The introduction of radium made possible the first effectual treatment of carcinoma of the uterus, as pioneered by Robert Abbé of New York. More recent landmarks in the development of gynecology are the introduction of tubal insufflation for the diagnosis and treatment of sterility by Rubin in 1920 and the establishment of the true nature of endometriosis by Sampson in 1922. The introduction of antibiotics has not only diminished the likelihood of infections in gynecological surgery, but promises to reduce the incidence of gonorrhea in women which, both in its acute and chronic forms, has long been one of the commonest conditions encountered in gynecology.

DERRICK VAIL

7

OPHTHALMOLOGY

By Derrick Vail, M D

Professor and Chairman, Department of Ophthalmology, Northwestern University Medical School, Chicago, Illinois

FROM the remotest times, man has been keenly interested in the eye and its diseases The individual having special knowledge and skill in the treatment of ocular disease has always been an honored member of society In the "Code of Hammurabi" established about 2000 B C , the eye was valued as much as life itself for it said, "If a physician operate on a man and cause the man's death, or, with a bronze lancet, open an abscess in the eye of a man and destroy the man's eye, they shall cut off his fingers " Those rules also show that the surgeon received the same fee for the saving of an eye as for the saving of a life

It appears to be impossible to determine accurately just when in the course of medical history ophthalmology became a separate discipline, for its career as a special field of medicine has not been an even one Many physicians and surgeons have always practiced some phases of the broad field of ophthalmology, depending upon their interest, skill, and training in this field Yet as time went on patients and medical colleagues have tended more and more to turn the care of the precious organ of sight over to those who have made a special study of the eye and its diseases, and who devote their full time to this discipline With the growth of knowledge in the entire scope of medicine, ophthalmology has become more and more complex and difficult to master, for the modern ophthalmologist should know not only much of general medicine, but also a great deal about neuroanatomy and neurology, optics, mathematics general and ocular pathology, visual physiology, embryology, genetics, physical and bio chemistry, bacteriology, and immunology, and should also possess current information on allergy, psychiatry, and other subspecialties For these reasons ophthalmology has rightly been called the "queen of medical specialties "

The application of all this knowledge pertaining to ophthalmology, painfully and often slowly acquired, has resulted in a decided decrease in the incidence of blindness throughout the years It is now possible to

say, without too much boastfulness, that with the knowledge now possessed, theoretically there should be no cases of blindness, except the irreducible minimum resulting from congenitally acquired conditions and the degenerative diseases

The springtime of ophthalmology began about 1850 with the advent of four men of extraordinary genius whose work supplemented each other's These were Franz Donders of Holland (1818–1869), Sir William Bowman of England (1816–1892), Herman von Helmholtz (1821–1894) of Germany, and the most brilliant clinician of all, most tragically short lived, Albrecht von Graefe of Germany (1828–1870) Due to the basic work of these four men and their immediate followers, the year 1878 in ophthalmology showed that physicians interested in diseases of the eye possessed almost all of the basic facts regarding ophthalmology that are available to us today Bowman's studies on the anatomy and surgery of the eye, Donder's on the physiology and optics of the eye, and the application of this knowledge to the correction of errors of refraction, von Graefe s work on glaucoma and cataract, as well as strabismus, and particularly von Helmholtz's discovery of the ophthalmoscope are the foundation stones upon which the modern structure of ophthalmology rests and are the reasons for its significance as a special branch of medicine

The opbthalmologist of 1878 had then at his disposal trial lenses for refraction prisms and the ophthalmometer, the perimeter for studies of the visual fields condensing lens and magnifying loupe for external examination of the eye, the wonderful ophthalmoscope for study of the ocular media and fundus, special instruments designed for ocular surgery such as the von Graefe cataract knife, Beer's knife, various speculums, fixation forceps, lens scoops, iridectomy forceps and scissors, Bowman's lacrimal probes and dilators, the Anel lacrimal syringe and many others in use today He had for drugs atropine and scopolamine for mydriasis, which he used for iritis, eserine and pilocarpine for miotics in the treatment of glaucoma the various forms of which were by then well recognized He shared with general surgery the benefits of asepsis and general anesthesia then known and practiced He was excited about the developing field of bacteriology and was beginning to apply this knowledge to the problems of ocular infections He had to wait until 1884 when Carl Koller discovered the local anesthetic properties of cocaine, but he was able to do sound ophthalmologic work, with the aid of a host of good textbooks (*e g*, Graefe Saemisch Handbuch der Gesammte Augenheilkunde 7 volumes, 1874–1880), beautiful atlases of ophthalmology, among the earliest of which was that of Eduard von Jaeger, Vienna, 1869, and followed by many others, mostly in German and French Indeed, it was essential in those days and for fifty or more years afterwards, that a well grounded and trained ophthalmologist have at least a working knowledge of French and German, and most of them who could do so, spent their training years on the continent visiting the eye clinics of

Berlin, Vienna, and Paris, and some went to London He subscribed to the Graefe Archiv fur Ophthalmolgie (1854), the Klinische Monat blatter fur Augenheilkunde (1863), the Archives d'Ophthalmologie (1853), Annales d'Oculistique (1838), Annale Ottalmologie (1874), Re ports of the Ophthalmic Hospital (London, 1857), and the American Archives of Ophthalmology (1869) He attended local societies of ophthalmology and had had the privilege of going to the first of any of the international congresses of medicine, the first International Congress of Ophthalmology held in Brussels in September, 1857 Others had fol lowed, *e g* , Florence, 1869, Vienna, 1873, Brussels, 1875, Ghent, 1877, and Amsterdam in 1879 (It is interesting here to note that the XVIth International Congress of Ophthalmology was held in London in 1950 and the XVIIth is planned for New York in 1954)

Our ophthalmologist of 1878, then had available much of the knowl edge of his specialty, and many of the tools of his trade that he has today He was handicapped severely if he did not know French and German and if he had not the advantage of several years of training in the European centers of ophthalmology

The next seventy five years show us a consolidation, additions to and refinement of the basic knowledge pertaining to ophthalmology available in 1878, especially in the subjects of anatomy, physiology, pathology, embryology, refraction and ophthalmoscopy, and even today here and there in these fields, basic discoveries are being made For example, the discovery of aqueous veins by Ascher in 1941 which is of great as sistance in furthering our knowledge of the mechanism of aqueous out flow

Ophthalmologists have been quick to seize on discoveries in other fields of science with great improvement in their therapeutics and instrumentation and equipment all making for greater ability in diag nosis and treatment of ocular diseases Examples of modern diagnostic apparatus evolved in the last fifty years are the electric ophthalmoscope, the projection perimeter, the binocular ophthalmoscope, the slit lamp and corneal microscope, the corneal contact lens and gonioscope revealing the secrets of the angle of the anterior chamber, the various tonometers for the taking of ocular tensions more or less scientifically, culminating in the electronic tonometer whereby graphic readings of ocular tension can be made continuously for five minutes, yielding an index of elevated or normal ocular tension The photograph in color of the ocular fundus is no longer an object of wonder, but has become a standard procedure of record and continuous study The radioactive isotopes are used in the treatment of corneal disease and for tracer substances in the study of ocular physiology The electron microscope is being used for the study of the nature of the vitreous Refined diagnostic tests of ocular motility and measurements of muscular imbalance are becoming more accurate as

the years go on, so that the correction of strabismus is becoming less and less a matter of hit or miss

With the advent of the sulfonamides and antibiotics the blinding infectious diseases have been appropriately attacked with the result that today in this country one rarely sees an acute case of trachoma, the virus (Halberstaedter-Prowazek) nature of which has only recently been recognized and confirmed, or of congenital or acquired interstitial keratitis due to syphilis Gonorrheal opbthalmia has been practically wiped off the map The introduction by C S Credé in 1884 of the prophylactic use of silver nitrate for the prevention of this disease in the newborn child resulted and still results in the saving of countless eyes It is easily within the memory of practicing ophthalmologists to recall the dreadful, prolonged and most expensive efforts in the wards of our hospitals to treat the newborn child afflicted with gonorrheal ophtbalmia With the use of sulfonamides the disease was cured in a matter of hours, and with penicillin in a matter of minutes Syphilitic optic atrophy is becoming a great rarity due to penicillin Ocular diphtheria is now of little significance tbanks to antitoxic serum Smallpox, prior to the general use of vaccine, was an important factor in the causation of blindness Today in the civilized areas of the world, the disease is negligible Leprosy still is capable here and there in tbe world of producing blindness, but the fight is on and the future is promising Ocular tuberculosis is still a problem, though more by its difficulties in early diagnosis, for its treatment with streptomycin has been sbown to be efficacious Thus we can say, with the rest of medicine, that bacterial diseases affecting the eye are no longer of much importance Viral diseases, however, still are capable of giving much ocular trouble and even blindness Trachoma seems to be the only exception at this moment to this statement

If ophtbalmology has borrowed heavily from general medicine in the past, it has repaid part of its debt in recent years by presenting medicine with tularemia, toxoplasmosis, further clarification of the problem of *thyrotrophic and thyrotoxic exophthalmos*, and congenital defects including cataract, due to measles in the first trimester of pregnancy

Blindness due to non infectious systemic diseases is still with us As life is prolonged by better medical care in these conditions, the eyes be come more and more involved, often leading to hopeless blindness This is particularly true in diabetes, kidney diseases, arteriosclerosis and vascular hypertension Dietary deficiencies also produce blindness chiefly by affecting the optic nerve The more we have learned about this the better the prophylaxis and treatment In this condition the deficiency of vitamin B appears to be the chief etiologic factor

Glaucoma, one of the chief causes of blindness, is still an unsolved problem although a great deal has been learned about it in the past decade, especially We believe that the disease can be more easily detected in its early stages than hitherto by new methods of examination

and the use of provocative tests, thus offering us better opportunity for medical or surgical treatment Filtering operations such as iridencleisis and corneal limbal trephine, and modifications have been developed during our period and have shown their value It can be said that these operations are between 60 to 70 per cent efficient in lowering the intra ocular pressure In spite of our best efforts it is sad to say that glaucoma often goes on to complete blindness, although less frequently today than seventy five years ago

Cataract, while it cannot be prevented or arrested, no longer presents much difficulty The surgical removal of it within its capsule before its maturity has become more or less standardized so that the operation is now successful in about 97 per cent of the cases This excellent result is due to better instruments, proper akinesia with local anesthetics, the use of spreading factors such as hyaluronidase, and in recent times and in a few hands by curare The use of intravenous anesthesia with sodium pentothal has been a great boon in opbthalmic surgery and is widely used for these short operations Operative infections are now prevented by aseptic technique, proper sterilization of instruments, and the pre and post operative use of antibiotics Should infection occur after surgery, prompt treatment locally and generally with the full range of the anti biotics available has resulted in practically no loss of the eye in the areas of the world where such things are available and used

In 1914 Jules Gonin of Switzerland discovered that sealing the tear or tears in a detached retina by cauterization frequently resulted in its reattachment and the restoration of vision Prior to that time the dis ease was considered as hopeless Since then the techniques and instru mentation of the operation have been further developed and now it can be said that between 67 and 85 per cent of such cases can be cured by surgery Further study continues

Keratoplasty, or the replacement of a piece of opaque cornea in an otherwise normal eye with an exact replica from the cornea of a donor eye, has become established, in the last decade particularly, as a method of restoring sight in many cases The transplant remains transparent in about 50 per cent of selected and suitable cases Again further efforts are continuously being made to increase the chances of success

The prevention of blindness in industry has taken great strides in the last few decades particularly Protective goggles prevention and more efficacious treatment of chemical burns improved lighting, the use of color and many safety devices have reduced markedly the incidence of ocular injuries in industry The development and use of the magnet and the accurate localization and measurement of the intraocular foreign body by x ray in our period has saved many an eye from disintegration due to intraocular metallic foreign bodies

Perhaps the greatest boon of all to modern ophthalmology has been the discovery of ACTH and cortisone These substances are highly

efficacious in inflammatory and allergic diseases of the anterior segment of the eye when applied locally They have also been of great value particularly in edematous diseases of the posterior segment, when given parenterally or intravenously Much is being learned about their indications and contraindications in ophthalmology and the knowledge about these substances is not complete as yet Enough is known, however, to say with confidence that many eyes that would have perished are now being saved They are particularly indicated in the collagen diseases that affect the eye

Electrophysiology of the eye and the development of the electroretinogram are now giving us other tools for clinical use, especially for the determination of the degree of retinal and optic nerve deterioration

Uveitis still is an unsolved problem and much work is being devoted to discovering the right answers The division of the disease into two easily recognizable groups recently advocated by Woods has been of much assistance These two groups are (1) the non granulomatous form considered to be of toxo allergic origin and (2) the granulomatous forms due to syphilis tuberculosis, leprosy, Boeck's sarcoid, brucellosis toxoplasmosis, histoplasmosis and other so far unknown granulomatous diseases

Retrolental fibroplasia, a new blinding ocular disease (1942) occurring only in infants prematurely born continues to baffle us in so far as prevention etiology and treatment are concerned It is becoming the major cause of blindness in children today

SUMMARY

Thus we see the emergence of ophthalmology as almost an exact science in these past seventy five years Refraction is much more precise and spectacle lenses better fitted and ground, perimetry has become more accurate and useful *tonometers are better made, calibrated and standard*ized the slit lamp and microscope have opened up new vistas of investigation of the anterior and most recently of the posterior ocular segment, comparable in importance to the discovery and use of the ophthalmoscope for investigation of the posterior segment The entire eyeball is now exposed to better illumination and higher magnification than has hitherto been thought possible Much more exact analysis of disturbance of ocular muscle balance has permitted a better surgical approach with great improvement in the statistical results of surgery in strabismus Contact lenses, still in the process of evolution have already shown their value in certain cases of conical cornea and for purposes of the theatre and sport particularly It is entirely possible that as they are better perfected, contact lenses may entirely supplant the use of spectacles, except for presbyopia

The past twenty years particularly have seen the rise of interest in experimental ophthalmology with an increasing number of well equipped laboratories devoted to these studies The promise for future discoveries, some of them revolutionary, hovers in the air and this present era is a most exciting one for ophthalmology

New staining techniques and histologic methods have further helped us in the study of diabetic retinopathy, what formerly were thought to be hemorrhages in this condition are in reality microaneurysms, allied in some way to the Kimmelstiel-Wilson bodies in nephrosclerosis The study of ocular disease due to heredity has continued to give us new and important facts, particularly regarding primary retinal pigmentary degeneration Recent studies have shown that hypertensive retinopathy can be reversed in suitable cases by proper diet or sympathectomy The plastic integrated movable orbital implant for ocular prosthesis, hailed with such enthusiasm a few years ago, has been most disappointing, but studies are proceeding

One can say with some confidence, having surveyed the advances in ophthalmology in the last seventy five years, that there is little or no excuse for blindness, anywhere in the world, due to trachoma, ophthalmia neonatorum, most other ocular infections, cataract, detached retina, nutritional diseases, and even glaucoma, if only the facts that are now known about the treatment and cure of these conditions can be put into effect

Last but not least, one of the greatest advances in ophthalmology has been the great improvement, especially in the civilized countries, in the training of ophthalmologists and the painfully slow growth and development of suitable ophthalmologic training centers

BIBLIOGRAPHY

CHANCE, B *Ophthalmology, Vol XX in Clio Medica*, New York, Paul B Hoeber, Inc , 1939

DUKE ELDER, S , and GOLDSMITH A J B *Recent Advances in Ophthalmology*, 4th ed , St Louis, C V Mosby, 1951

RIDLEY, F , and SORSBY, A *Modern Trends in Ophthalmology*, Vol I, London Butterworth, 1940

SHASTID, T H *History of Ophthalmology*, in *American Encyclopedia of Ophthalmology*, Vol XI, pp 8524–8904, Chicago Professional Press 1917

SORSBY, ARNOLD *A Short History of Ophthalmology*, 2nd ed , London Staples Press, Ltd , 1948

———— *Modern Trends in Ophthalmology*, Vol II, New York, Paul B Hoeber, Inc , 1951

VAIL, DERRICK *1950 Year Book of the Eye, Ear, Nose and Throat*, pp 7–12, Chicago, Year Book Publishers Inc , 1951

VILLARD H *History of Ophthalmology in Traité d'Ophthalmologie*, Vol I, pp 3–84 Paris, Masson et Cie, 1949

CLINTON I COUPER

8

ORTHOPEDIC SURGERY

By Clinton L. Compere, M.D., F.A.C.S.

Assistant Professor, Department of Bone and Joint Surgery, Northwestern University Medical School, Chicago, Illinois

THE specialty of orthopedic surgery was born in Paris, France, with the publication of the first orthopedic textbook, entitled "L'Orthopédie," by Nicholas Andry in 1741. The term was derived from two Greek words meaning "straight child." During the subsequent one hundred years, there were few physicians limiting their practice to the bone and joint field, although many valuable contributions were made to the literature.

In the second quarter of the nineteenth century, orthopedics as a specialty began to achieve minor recognition in France, Great Britain, and the United States. Subcutaneous tenotomy and osteoclasis for deformity were relatively common procedures, but the armamentarium for treatment of deformities was limited, and crude by more modern standards. Diagnosis and treatment of disease was uncertain, handicapped by inadequate knowledge of etiology and pathology.

The discovery of ether as an anesthetic in 1846 by Morton, Warren and Bigelow greatly stimulated the development of surgical procedures and technique. Great strides in surgery were made during the subsequent thirty years with the use of antiseptic and then aseptic techniques. A great contribution to orthopedics was made in 1852 by Mathijsen, with the development of a method of using bandages impregnated with plaster of paris, for immobilization.

During this period of time, Hugh Owen Thomas of England was obtaining fame and renown as a physician and as the foremost orthopedist of his day. Thomas was a great physician with stern honesty toward his colleagues and his patients. He advocated uninterrupted immobilization in the treatment of fractures, and the Thomas splint which he developed has been and still is of immeasurable value in the emergency

transportation and treatment of fractures of the lower extremity Sir Robert Jones was a colleague and student of Thomas', and his contributions to orthopedic teaching were numerous and sound He was not as uncompromising as Thomas, was much more diplomatic, and his teachings were therefore more readily accepted They both disagreed with Ling and Champonniere who advocated and taught massage and active motion in the rehabilitation of traumatic disabilities

It is interesting to note that our practical knowledge of the basic medical sciences is less than a century old Significant advances in our knowledge of the physiology and pathology of bone, cartilage, and muscle were made during the period from 1850 to 1900 Of particular interest was the discovery of the relation of certain bacteria to surgical infections by Koch in 1878 In 1882 he discovered the tubercle bacillus and proved its relation to tuberculosis by the application of his four postulates The many surgeons contributing to the development of the specialty during the subsequent years cannot be given proper individual mention in a brief historical review Several hospitals limited to the treatment of orthopedic diseases were opened in New York City, in Boston, and elsewhere Knight, Taylor, Sayre, Lambotte, Royal Whitman, Bradford, Hibbs, Ridlon, Brown, Albee, Gibney, Lane and Jones, are but a few of the surgeons actively contributing during this period Hugh Owen Thomas was certainly the greatest and most influential orthopedist of the nineteenth century He was a thorough student, his approach to any problem was based on reason and logic, and his therapy was practical, with due respect to the patient as an individual John Ridlon, Thomas' chief disciple in the United States, was graduated from the College of Physicians and Surgeons in New York in 1878 Entering orthopedics in 1880, he studied with Thomas in Europe upon two occasions In 1889, he moved to Chicago after a disagreement with Dr Shaffer over the use of a Thomas splint Ridlon was aggressive, dynamic, personable, and successful In Chicago he received many appointments and honors He was *conservative, not doing much surgery, and his* greatest contribution was the training of many outstanding orthopedists who have carried the gospel of Thomas and Ridlon throughout the continent In 1887, the American Orthopedic Association was founded with Ridlon in rather complete political control for almost twenty years Many of the early members were general surgeons who tended to limit their work to the conservative and even non-operative treatment of crippling deformities These physicians were often referred to as "strap and buckle' surgeons

The discovery of the *x* ray by Roentgen in 1895 gave orthopedics the added weapon necessary for proper evaluation and intelligent treatment of skeletal diseases Many new operative techniques were developed, Sir W Arbuthnot Lane of England and Albin Lambotte in Belgium described open operations for reduction and internal fixation of fractures

The Chicago Orthopedic Society was founded by Doctor Ridlon in 1901 Royal Whitman's textbook "Orthopaedic Surgery," was published in the same year, and DeForest Willard wrote his book on "The Surgery of Childhood" in 1910 Hibbs described his operation for fusion of the spine, and Albee introduced the bone graft techniques for spine fusion in 1911

It was not until World War I that orthopedics gained recognition as a major specialty Orthopedic surgeons were given responsibility for the organization of units for the treatment of battle casualties, with the Americans, Osgood, Allison, Wilson, Goldthwait, Orr and others working first under the direction of Sir Robert Jones, who became a general in the War Office in London The use of Thomas splint teams at the front was credited with a 50 per cent reduction in mortality for compound fractures of the lower extremities Jones also organized special treatment centers in the British Isles, for definitive reconstruction care, and this pattern was followed in the United States during World War II Many young surgeons received their first indoctrination in the care of skeletal injuries and disease during the war The value of early and adequate surgical care with proper immobilization was established with a division of opinion between the open irrigation versus the closed plaster method as developed by Orr, for the management of infected compound wounds Interest in this specialty for young physicians was stimulated and training programs were expanded throughout the world Until World War I, there were two definite schools of orthopedists—one school adhering closely to the principles of brace, manipulation and exercise treatment, and the other leaning toward surgical treatment of orthopedic diseases and deformity Following the war, these two schools were rather effectively coordinated, at least in the major teaching centers

Medical discoveries of the last twenty five years have tremendously changed the perspective and scope of orthopedics Thirty years ago skeletal tuberculosis represented 25 to 50 per cent of an orthopedic hospital practice Today skeletal tuberculosis has become an uncommon disease due to the effectiveness of preventive measures The problem of backache and sciatica is and has always been a difficult problem for the orthopedist, but much of the mystery has been explained by intelligent study and research Rupture or herniation of the intervertebral disc was first described by Middleton and Teacher in 1911, but its significance was not properly understood The true significance of this lesion was explained by an orthopedist, Barr, and a neurosurgeon, Mixter, in 1934 Since that time thousands of patients with intractable sciatica have been rehabilitated with surgical or conservative therapy There has been much research directed toward the etiology and treatment of scoliosis in the adolescent child, but there is still disagreement with regard to the proper management of this disabling condition Surgical arthrodesis of the spine after correction of the curve is necessary for the small per

centage of patients with a steadily increasing curvature Many new methods of casting and bracing have been recommended, but the critical problem of prevention is largely unsolved

It is only in recent years that metal internal fixation of fractures has been widely taught and accepted The surgical technique was adequately described by Lane and Lambotte at the turn of the century but complications were too great for general acceptance by the profession Internal fixation for fractures of the neck of the femur was first described in 1897, but the procedure was not popularized until advocated by many surgeons between 1920 to 1930 There are scores of gadgets used for this purpose, with the Smith-Peterson nail by far the most popular Internal fixation of a fractured hip following adequate reduction, is now recognized as the proper procedure for most hip fractures, with a marked reduction in patient morbidity and mortality The most valuable contribution to the problem of internal fixation was made by Venable and Stuck in 1938 when they established the importance of using an inert metal which was non-electrolytic in the host tissue They found that the alloy vitallium, which had been used by dentists, caused no tissue reaction in bone and soft tissue Further study has developed several stainless steels that are essentially as inert as vitallium, and steel has the advantage of not being brittle Significant advances in the type of plates and screws used for internal fixation have been made

The use of intramedullary nails or rods for the internal fixation of fractures of long bones was first described in 1937 with a more detailed description by Kuntscher in 1940 Threaded pins, Steinman pins, Kirschner wires etc, had been previously used by many surgeons for certain fractures The use of the large nails in fractures of the femur was adopted by the German Army Medical Service and our American British surgeons were astonished by the results observed in many German prisoners so treated Since the war, intramedullary fixation has been adapted, with improvement in the types of nails for use in most of the long bones of the body It is particularly adaptable for fractures of the middle third of the femur and is now used routinely for this fracture by many orthopedic surgeons The serious problems of coxa malum senilis, ankylosing arthritis of the hip, nonunion of fractures of the neck of the femur, avascular necrosis, etc, have always been with us and have always been very difficult to alleviate Arthroplasties of the hip and other joints have been carried out for many years with indifferent success Many substances have been used for interposition between the femur and the acetabulum During the past fourteen years, the vitallium cup as devised by Venable and Stuck, with the operation as outlined by Smith Peterson, has been used for thousands of hip arthroplasties with fair results Molds for the head of the femur of nylon, acrylic, and other plastics have been used Most recently our specialty has gone a step further and is now in a phase of prosthetic replacement of the head of the femur for many of these con

ditions The first large series of patients so treated was from the clinic of Judet and Richard in Paris They use an acrylic prosthesis with a stem which fits down the neck of the femur and through the outer cortex of the femur At the time of the meeting of the American Academy of Orthopedic Surgeons in January 1953, a special committee had received data on over 5000 prosthetic replacements and this is only a portion of those that have been carried out in the United States during the past three years The type of prosthesis being used varies with the surgeon's individual experience, there are at least a score of prosthetic designs now being tested and used in the United States The trend is away from the acrylic prosthesis and toward the use of steel

During the past twenty five years, there has been a steady development of experience with bone grafting techniques Most orthopedic surgical centers maintain bone banks with homogenous bone obtained under aseptic conditions from amputated extremities, ribs, and occasionally from fresh cadavers The original enthusiasm for the use of bone bank bone has been modified by experience It has now been determined that although bone bank bone will usually be accepted and replaced by the host, it is not as certain as autogenous bone and the replacement is much slower The use of homogenous bone is now recommended only when the availability of autogenous bone is restricted, as for scoliosis fusions in children, for the packing of large bone defects, or for supplementing major autogenous grafts

The discovery of various hormones and vitamins has been of immense importance and influence upon orthopedic practice One must mention specifically the discovery of vitamin D and its role in the prevention of rickets True rachitic deformities, formerly so common, are now rare, although mild deformities due to vitamin D resistance still occur and must not be overlooked Other vitamins such as C and B are necessary for proper healing of bone, soft tissue, and for nerve regeneration, and B_{12} is apparently a powerful stimulant for growth Most of the deficiency diseases are now understood, and the importance of proper hormonal balance is well recognized Sex hormones play a significant role in the anabolism of protein for growth and tissue replacement Pituitary or adrenal dysplasia can produce a severe osteoporosis or Cushing's syndrome The effect of the parathyroid hormone as in von Recklinghausen's hyperparathyroidism was established twenty five years ago The importance of the serum alkaline phosphatase as an index of osteoblastic activity is a common laboratory determination An elevated acid phosphatase is exceedingly important in determining the presence of a prostatic malignancy With our present laboratory facilities and knowledge, we can now establish unequivocably diagnoses that were hypothetical a few years ago Most recently the new pituitary and adrenal hormones, ACTH and cortisone, have been used for the treatment of dozens of diseases The first wave of enthusiasm has subsided with recognition of many

limitations and dangers from indiscriminate use That they are effective in influencing rheumatoid arthritis, adrenal hypofunction and various collagen diseases is established For orthopedists, they permit surgical procedures that would not otherwise succeed Hydrocortisone, or compound F is being used effectively, though recklessly, throughout the continent for any joint abnormality of a noninfectious nature Much research and evaluation must be completed to give us proper indications and contraindications for use of these powerful drugs

As in all other branches of medical science, the discovery of the sulfonamides by Domagk in 1932 and of the therapeutic value of penicillin by Fleming Chain and the Floreys in 1938 has brought about a tremendous reduction in the incidence of pyogenic infection, osteomyelitis, suppurative arthritis and postoperative morbidity More recently we have the large group of mycin antibiotics that are effective orally and are potent against most common pathogenic bacteria With these powerful weapons, many reconstructive procedures are possible that previously were foolhardy and doomed to failure The antibiotics have been of tremendous value in war surgery, speeding up wound healing and minimizing metastatic infections Acute hematogenous osteomyelitis is now a rarity It is undouhtedly prevented in many instances by the routine use of an antibiotic by pediatricians for ear infections, sore throats, furuncles, etc, before a bone symptom has arisen Prior to the advent of penicillin, acute osteomyelitis was one of the most fatal and depressing conditions to treat The antibiotics permit cure of many patients without surgery, and with suppurative arthritis a useful joint can often be salvaged with intelligent use of the antibiotics combined with judicious surgical intervention

No historical discussion can be complete without reference to the problem of poliomyelitis Because of the crippling paralysis that occurs in a certain percentage of patients afflicted with this disease, the orthopedic surgeon has become increasingly responsible for the direction of care after the acute phase has passed The treatment of poliomyelitis has received inordinate publicity during the past twenty years because of the powerful personalities of two individuals—Franklin D Roosevelt and Sister Elizabeth Kenny The March of Dimes campaigns were started in the early 1930's and the National Foundation for Infantile Paralysis was organized in 1938 The annual fund raising campaigns have been outstandingly successful, and since its inception the National Foundation has financed a major share of the treatment of *poliomyelitis* Grants from the Foundation are used for extensive research on the treatment and etiology of the condition

The Australian nurse, Sister Kenny, came to this country in 1939, preaching and teaching her theory and method of treatment for poliomyelitis Although she was rather ignorant of basic medical and physiological knowledge, her enthusiasm and determination caused a thorough

review and evaluation of the current methods of treatment of the disease throughout the continent Her routine of treatment was not widely accepted by the medical profession, but the interest that she aroused has unquestionably resulted in improved treatment for the poliomyelitis patient

Great advances in the surgical treatment of poliomyelitic deformities and crippling paralysis have been made The route of infection, probably through the gastrointestinal tract, has been fairly well established Research sponsored by the National Foundation for Infantile Paralysis has identified at least three strains of virus that cause the disease Until most recently, there was no effective preventive measure There is now a strong probability that an effective vaccine will soon be developed which will proffer immunity against the disease We know that gamma globulin will raise the resistance of a patient to the disease for a short time, and there are high hopes that a vaccine will shortly be available for clinical trial

Following World War I, the number of young surgeons receiving special training in the field of orthopedic surgery steadily increased The American Orthopedic Association was limited in membership to one hundred and fifty, and the need for a larger organization to include all qualified orthopedic surgeons soon became obvious To meet this need, several of the most active members of the American Orthopedic Association met in Chicago in 1933 and founded the American Academy of Orthopedic Surgeons The original founding group was composed of Campbell, Henderson, Ryerson, Lewin, Gaenslen, Mumford and Orr Plans for the American Board of Orthopedic Surgery were made in the same year, and in 1934 this Board began to certify orthopedists who could fulfill its qualifications A large number were certified without examination as charter members The Board set up standards for basic science and clinical training Except for a temporary decrease during World War II, there has been a steadily increasing number of young surgeons training in the specialty Following the war, hundreds of surgeons who had participated in military orthopedic services received training in approved residencies for Board certification For the greater part of the war, the Surgeon General of the Army was an orthopedist and the services throughout the military hospitals were very effectively organized to give efficient specialty care in all branches of medicine and surgery The surgical hospitals operated in the combat zone, very close to the fighting lines. Evacuation to a field or base hospital rendering definitive care was prompt and efficient in most theaters Airplanes were used for evacuation wherever possible, and the lessons learned were carried over into the war in Korea Extremity wounds have always represented 70 per cent of the battle casualties The rate of survival and recovery has steadily improved as a result of a combination of many factors rapid evacuation by helicopter or airplane to a hospital equipped for definitive care, the use

of effective antibiotics, and the proper and adequate use of plasma and whole blood infusions

During World War II the value of properly organized sections of physical rehabilitation and physical medicine was recognized Lessons learned in the military hospitals have stimulated the organization of rehabilitation centers throughout the continent Concurrently there has been the development of the specialty of physical medicine The scope of this specialty is rapidly expanding to assume the evaluation and treatment of orthopedic, neurosurgical and cardiac conditions that have received maximum benefit within the given specialty

SUMMARY

At the present writing, there are 2,152 orthopedic surgeons certified by the American Board of Orthopedic Surgery and thousands of industrial and traumatic surgeons who do not strictly limit their practice In each of the last few years, between 200 and 300 young physicians have been certified As the number of well trained orthopedists has increased there has likewise been a steady and ever growing demand for their services throughout the world

As a specialist, I disagree wholeheartedly with those who state that specialists tend to know more and more about less and less I feel that we must know *more and more about more and more* In private practice in 1953 an orthopedic surgeon must be a competent anatomist, have a thorough knowledge of the physiology of the human body, he often must be a practical psychiatrist, a specialist in physical medicine for the proper therapy and rehabilitation of his patient, a competent radiologist, for every orthopedist reads his own *x* rays before proceeding with therapy, he should have a solid background of the pathology of orthopedic lesions, he must be a prosthetist in order to properly prescribe artificial appliances and last but far from least, he must be a skillful diagnostician and surgeon

JULIUS LEMPERT

~ 9 ~

OTORHINOLARYNGOLOGY

By Julius Lempert, M D , F.A A O O

Director of Otologic Surgery, Otologic Research and Postgraduate Teaching, Lempert Institute of Otology, New York, New York, Research Professor of Otology, Tufts Medical School, Boston, Massachusetts

THE numerous advances made in otorhinolaryngology during the past seventy five years make it difficult indeed to select the names and events to be mentioned in a brief account of the period In the survey that follows I must necessarily include only the historical "first" contributions and the discoveries that I believe have proved to have had lasting significance in otorhinolaryngology Furthermore, I have limited myself primarily to the United States

Ever since Schwartze[1] in 1873 first described the simple mastoidectomy for acute suppurative mastoiditis and the Schwartze Stacke radical mastoidectomy for otherwise incurable chronic middle ear suppuration, and up to the advent of sulpha therapy and antibiotics, in 1937 and 1939 the practice of otology consisted mainly of the surgical treatment of a middle ear abscess and the complications resulting therefrom During the period 1873 to 1939, however, great American contributions were made to clinical diagnosis and histological studies of temporal bone disease which stimulated the progressive evolution of the surgical treatment of temporal bone infection and the various complications which often accompanied it

OTOLOGY

To trace the history of American otology as a separate specialty in the past seventy five years I shall mention some names and events prior to the final quarter of the nineteenth century In 1871 the American Otological Society had been founded and had begun its annual meetings attended by distinguished otologists In 1878 the American Medical Association's joint section on Ophthalmology and Otolaryngology held

its first meeting in Atlanta The American Laryngological, Rhinological and Otological Society began its organization in 1895 under the leadership of Edward B Dench, Joseph O'Dwyer, and Robert C Myles All these societies came into being before any similar groups were founded in England or in Europe

As I have inferred, the primary concern of many otologists of that day was mastoid surgery The first simple mastoidectomy in the United States probably was performed in Philadelphia about 1864 by Lawrence Turnbull who had been a pupil of Politzer However, Emil Gruening, in New York, was the first to publish a precise and detailed analysis of the surgical procedure, slightly modifying Schwartze's original technique Gruening about the turn of the century was the first to advise that when the mastoid process harbored purulent inflammation extending beyond the antrum and involving the body of the bone, the tip should be removed as a routine matter In 1905, Frederick Whiting advocated another modification of the Schwartze Gruening procedure, insisting that all the cellular structure from within the mastoid process, including the cells within the mastoid tip must be exenterated during the performance of a simple mastoidectomy In the decade from 1895 to 1905, important contributions to mastoid surgery were made by Bacon, Knapp, Blake, Orne Green, Roosa, Randall, McKernon, and others

As early as the 1890 s it had been observed that facial paralysis could result from suppurating middle ears or mastoiditis and that recovery from the paralysis sometimes followed the arrest of the purulent discharge However since a considerable amount of mastoid surgery in those days was also being performed by otorhinolaryngologists poorly trained in otology accidental injury of the facial nerve became a problem In the next following decades surgical experiments on anastomosis of the injured facial nerve were carried out in the United States by Cushing Frazier Spiller Keen Taylor Elsberg, Beck Adson Lillie and others with less than complete success On a visit to this country in the 1920 s Sir Charles Ballance formed a team with Arthur B Duel to conduct animal experimentation on nerve grafting Their researches led to the presentation of the Ballance Duel operation[2] for repair of facial nerve injury As important as the Ballance Duel contribution was to otology, it must be admitted that a much better aid to otologic surgery and to humanity would have been better training of temporal bone surgeons so that facial nerve injury would become less frequent If, in spite of better knowledge, facial nerve injury did sometimes occur, the surgeon would know when, where and how it happened With such understanding, an occasional injury to the facial nerve would be easily overcome, immediately, on the operating table as a rule, and permanent facial paralysis requiring the Ballance Duel operation would be avoided

Early in the century Edward B Dench had popularized the radical mastoidectomy for chronic suppuration within the temporal bone and

had set down the indications for this procedure Emanuel Libman, world famous American internist, in 1911 made an outstanding contribution to otology by pointing out that in jugular sinus thrombosis a positive blood culture is obtainable In 1912, Alfred Braun published his comprehensive treatise on the pathology, symptomatology and surgical treatment of sinus thrombosis

Following Barany's notable publication of 1907[3] on the physiology of the vestibular labyrinth, Isador Friesner and Alfred Braun, with their book issued in 1916, greatly advanced our knowledge of clinical labyrinthitis Early in the 1920's George E Shambaugh, Sr , added further to our understanding of the internal ear by publishing his histologic studies of the inner ear This highly significant work was augmented by Stacy Guild's investigations into the correlation of the histologic with the clinical picture of inner ear diseases

The publication in 1927 of my paper, "Simple Subcortical Mastoidectomy"[4] laid the foundation for the gradual development of today's modern temporal bone surgery

In the 1920 s Wells P Eagleton's extensive investigations for unlocking the petrous pyramid of the temporal bone pointed the way in many instances to prevention of suppurative meningitis following temporal bone surgery In the same period came Samuel J Kopetzky 's systematization of the symptomatology of suppurative petrositis and Ralph Almour's perforating technique for drainage of the infected petrous pyramid Late in the 20's and early 30's Barry J Anson and Theodore H Bast added their researches on embryology and anatomy of the temporal bone

Publication of my paper, ' Complete Apicectomy," in 1937[5] provided otology with the first technique for the complete exenteration under direct vision of the entire cellular structure within the petrous apex in suppurative apicitis My endaural approach to all temporal bone surgery described in 1938,[6] has been almost universally adopted since the advent of the antibiotics

In the field of hearing testing before the turn of the century several Americans had described electrical instruments of various kinds for this purpose, among them Carl E Seashore, in 1899 Somewhat later W Solner Bryant, L W Dean, C C Bunch and others had conducted significant experiments with electrical testing instruments but it was not until 1922, following the development and construction of the electron tube that Harvey Fletcher, R L Wegel and Edmund P Fowler, Sr with the cooperation of the Bell Telephone Laboratories and Western Electric Company, introduced the first commercial audiometer of the vacuum tube type In 1928 Fowler s description of the recruitement phenomenon furnished the otologist with an additional means for differentiating between various forms of inner ear deafness

Before the introduction of the audiometer, however, important progress had been made in work for the hard of hearing Max Goldstein's efforts in St Louis at the Central Institute for the Deaf were an outstanding contribution toward rehabilitation of the deafened Alexander Graham Bell's rehabilitation work in Boston was a notable milestone, even apart from his famous electrical researches undertaken in an effort to convey speech by wire to his deafened wife That work, which resulted in the invention of the telephone, of course hastened progress in the development of the audiometer Fowler, Sr 's popularization of audiometry in turn stimulated wide interest in the United States in problems of the deafened and their rehabilitation

In 1930 Ernest G Wever and Charles W Bray[7] opened a new field of investigation into the physiology of hearing with their discovery of the electrical potentials of the ear

The advent of the antibiotics, in 1937, which enabled otologists to control middle ear infection and often prevent it from infiltrating the temporal bone and spreading to the intracranial structures, greatly diminished the formerly frequent necessity for surgical intervention Because of the resulting shortage of temporal bone surgery, an impression had been created and became widespread that otology as a specialty was finished However, it soon became apparent that the antibiotics, instead of striking the death knell of otology, had in reality laid the foundation for its renaissance The antibiotics brought about a new era in temporal bone surgery in which labyrinthine surgery has been developed to a degree heretofore considered impossible

One of the problems still confronting the otolaryngologist is the pathology and treatment of Meniere's disease In the 1940's Kenneth M Day made a significant contribution to this subject with his surgical procedure for the relief of vertigo in Menière's disease by electro coagulating the membranous vestibular labyrinth through an opening in the semicircular canal This technique replaced W E Dandy's earlier and more complicated procedure of sectioning the vestibular branch of the VIIIth nerve Another surgical procedure for the relief of vertigo and tinnitus in Meniere's disease was my decompression operation[8] described in 1948—a technique which consists of the removal of the stapes and the round window membrane by partly disengaging the tympanic membrane from the sulcus tympanicus and without opening the mastoid process

Another unsolved problem for otologists had been effective treatment of deafness due to otosclerosis As a result of my carefully controlled research studies published since 1938, four fundamental surgical principles were established for restoration and permanent maintenance of practical serviceable physiological hearing function in patients deafened as a result of otosclerosis The fenestration operation, making use of these basic principles opened a new, almost inexhaustible field in temporal bone surgery and made it available to the properly trained otologist

The basic surgico technical principles of fenestration surgery are

1 *The one stage exteriorized endaural fenestration technique*[9] to replace the three stage postauricular exteriorized Sourdille technique This practical one stage technique rendered fenestration surgery acceptable both by the otologists and the hard of hearing patients

2 *The bone dust free cupola technique for creating the fenestra* [10] This technique permits exposing to view the membranous laybrinth *in situ* without subjecting it to trauma or injury otherwise sustained by the necessary removal of bone chips which unavoidably enter the perilymph space when the old pulverization technique is practiced By employing this bone dust free technique the postoperative inflammatory reaction of the membranous labyrinth bas been reduced to an absolute minimum The incidence of further impairment of hearing, occurring as an immediate and direct result of the fenestration operation, has thus been reduced to less than 1 per cent Perilymphatic osteogenesis, formerly resulting from the irretrievable loss of bone splinters within the perilymph space, is thus also avoided

3 *The fenestra nov ovalis technique* [11] During the performance of revisions of osteogenetically closed fenestras following the use of the one stage technique, I have observed and recognized the fact that osteogenetic repair is less likely to occur when the fenestra is made in tbe surgical dome of the vestibule where the fenestra could be made much wider than in the much narrower portion of the external semicircular canal posterior to the ampulla This resulted in the development and employment of the fenestra nov ovalis technique which I have described and published With this technique after removal of the incus in addition to the head and neck of the malleus, it became possible to create within the surgical dome of the vestibule a much wider fenestra than by fenestrating into the mucb narrower and much sballower perilymph space of the external semicircular canal posterior to the ampulla The importance of this basic surgico technical principle of fenestration surgery soon became obvious as a result of the tremendous increase in the percentage of permanently patent fenestras following its universal adoption by the otologists However, the explanation for this fact was not yet quite clear Since the only way to prevent ultimate closure of the fenestra gap is to prevent osteogenetic repair of the fenestra rim, I knew of no reason wby osteogenesis should not take place in a freshly injured rim of a wide fenestra, just as readily and as frequently as in a narrow fenestra Neither did I understand why, despite the markedly increased percentage of permanently patent fenestras resulting with the exclusive use of the fenestra nov-ovalis technique, about 30 per cent of the fenestras still closed as a result of osteogenesis This fact convinced me that the creation of a wider fenestra, though obviously important, is in itself not the complete answer to the prevention of osteogenetic closure of the newly created fenestra. The suspicion that some other factor

besides the creation of a wider fenestra must be at work in the prevention of osteogenetic closure of the fenestra gap could not, therefore, be dismissed

4 *The invagination technique for the deliberate and consistent prevention of osteogenetic repair and closure of the fenestra nov ovalis* [9 12 14] After making the fenestra in the surgical dome of the vestibule and placing the tympanomeatal flap so that it covers and contacts the entire bony region outside the fenestra gap, the portion of the tympanomeatal flap which faces the fenestra gap is invaginated into the gap sufficiently only to contact intramarginally the fenestra rim

A cotton inlay, moistened in Ringer's solution, is then placed over the invaginated portion of the tympanomeatal flap and moulded so that it forces the inner surface to contact, and stay in contact, with the fenestra rim edges intramarginally This favors its adhesion intramarginally to the bony fenestra rim The cotton inlay is secured and held in its position with a piece of paraffin mesh gauze moulded over it The rest of the cavity is packed with paraffin mesh gauze to hold the initial packing in its position

The theory, that invagination of the portion of the tympanomeatal flap which covers the region of the fenestra proper into the fenestra gap is essential for the prevention of osteogenetic closure of the fenestra, was first advocated in 1938[9] and reiterated in 1947 [12] This theory was finally and indisputably proven to be correct [13 14]

As a result of observations which I have made by inspecting a large series of postoperative fenestra regions and comparing and differentiating the findings which could be held responsible for osteogenetic repair having taken place in some fenestras and not in others, the following facts are given

1 Osteogenetic closure of the fenestra gap takes place only when the tympanomeatal flap covering it does not become adherent to the fenestra rim

2 The tympanomeatal flap never becomes adherent to the fenestra rim unless the portion covering the fenestra proper becomes invaginated into the fenestra gap

3 Whenever the flap became invaginated into the fenestra gap and it became adherent to the fenestra rim, osteogenesis was prevented and the fenestra remained permanently patent

4 Whenever the flap remained tightly stretched across the fenestra gap without becoming accidentally invaginated into the gap, osteogenesis was prevented only on the outer surface of the bony capsule to which the flap became adherent, but not in the rim of the fenestra gap with which the flap did not come in contact and to which, therefore, it could not become adherent

5 Accidental non planned invagination of the tympanomeatal flap into the fenestra gap took place frequently ever since the adoption of the

fenestra nov ovalis technique whereby the creation of a much wider fenestra was made possible This fact suggested that a wider fenestra facilitates invagination of the tympanomeatal flap into the fenestra gap

6 Accidental non planned invagination took place only rarely following the use of the technique whereby only a very narrow fenestra could possibly be made within the external semicircular canal posterior to its ampulla This fact suggested that a narrow fenestra hinders invagination of the flap into the fenestra gap

The performance of the fenestra nov ovalis operation may be considered when the hearing for airborne sound in an otosclerotic ear has audiometrically receded to the 40 decibel level or lower in the 512–1024 and 2048 pure tone frequencies, which frequencies are the most important for the intelligibility of the spoken voice Below those levels, air conduction hearing ceases to be useful for social and economic contacts

However, the conclusion, that the performance of the fenestra nov ovalis operation can result in the restoration of practical serviceable and unaided hearing in an ear deafened as a result of otosclerosis, may be reached only in the presence of obtainable evidence suggesting that there still exists in that ear a sufficient amount of cochlear nerve function not being utilized by the functionally impeded air conduction mechanism which can permit such an improvement in hearing for airborne sound following creation of a new oval window

The cochlear nerve function reservoir in an ear deafened as a result of stapedial ankylosis due to otosclerosis may be considered adequate for the restoration of practical serviceable and unaided hearing with the fenestration operation when (1) the preoperative bone conduction hearing for the 512–1024 and 2048 pure tone frequencies, when tested audiometrically with care and understanding, is found to be not lower than the 30 decibel level, and the decibel level of the bone conduction hearing is at least 25 to 30 decibels higher than the decibel level of the air conduction hearing, and (2) the intelligibility for the normally spoken voice and whisper is improved to the practical level with the aid of either the old fashioned speaking tube or the ear trumpet

Experience has shown that an improvement in hearing for air conducted sound following fenestration must reach at least the 30 decibel level in the 512–1024 and 2048 frequencies to be considered as serviceable enough for social and economic purposes and obviating the necessity of wearing a hearing aid

Hearing can be restored to the practical level or higher, even as high as the normal level by the fenestration operation, providing the reservoir or unused cochlear nerve function still present at the time of operation is sufficient to permit such restoration of hearing In the presence of an adequate cochlear nerve function reservoir the degree of the preoperative hearing loss for airborne sound, no matter how great, will nevertheless not interfere with restoration of practical hearing

Today, with indisputable ability to restore physiologic hearing in a large percentage of cases and after having already maintained such results for periods as long as fifteen years, otologists need no longer hesitate to recommend the fenestration operation in suitable cases of clinical otosclerosis

RHINOLOGY AND LARYNGOLOGY

To report the more important names and events in rhinology and laryngology in the last seventy five years it is again necessary to go back to 1873 That year, through the efforts of Clinton Wagner, a former Civil War surgeon, the New York Laryngological Society was founded The United States thus became the first country in the world to have a society exclusively for the study of diseases of the nose, throat, and larynx This society was later merged with the New York Academy of Medicine The first national group in this field of otorhinolaryngology was the American Laryngological Association, founded in 1879, with Louis Elsberg and George M Lefferts as guiding officers Wagner must receive credit, too, for establishment of the first hospital exclusively for treatment of nose and throat diseases—the Metropolitan Throat Hospital which likewise came into being in 1873 Another notable event of that year was the organization of Harvard Medical School's department for instruction in nose and throat diseases, the earliest on record in this country, although several years prior to that, J Solis Cohen had begun the first courses in laryngology at Jefferson Medical College in Philadelphia

One of the principal advances in the otorhinolaryngologic field during the last quarter of the nineteenth century was the theory put forward by Burt R Shurly in Detroit, in 1879, that diphtheria was a germ borne disease Joseph O'Dwyer, in New York, revolutionized the treatment of diphtheria by introducing, in 1894, intubation for stenosis of the larynx This innovation was the forerunner of bronchoscopy

In the decades before the turn of the century many other important contributions were made Thomas R French, in 1883, in Brooklyn, was among the earliest to report findings that lymphoid tissues of the throat, other than tonsils, harbored infection Joseph L Goodale, in Boston, about 1897, proved the absorptive power of the tonsil by injecting carmine into the tonsil crypts and observing the passage of the dye into the underlying lymphoid tissue In the same period, French became the first to introduce photography of the larynx

Also in the final quarter of the nineteenth century, in the field of clinical rhinology, Francke Huntington Bosworth, following the introduction of cocaine, perfected the saw for removal of septal spurs and published an extensive survey of rhinology in the United States and Europe William C Jarvis, in 1877, invented the snare made of piano wire for removal of nasal polypi Jarvis also made valuable contributions to the subject of paralysis of the vocal cords His findings were later

augmented importantly by Brien King through his surgical procedures for hilateral abductor paralysis Morris Asch, working in New York, devised the stellate punch and described surgery for correction of de flected septa Emil Mayer, in New York, and John Roe, in Rochester, were the first to advocate submucous resection of the nasal septum Otto T Freer later introduced his technique (1904) which became the basis for today's submucous resection operation Nowadays, of course, nasal septum surgery is no longer just a removal of deviation, but concerns itself with reconstruction of the anterior nares by surgery to the cartilage of the nasal tip

Other names and milestones in rhinology which cannot be overlooked in even so brief a survey are George W Caldwell, of New York, who as early as 1893 had performed the first canine fossa maxillary sinus opera tion, and Cornelius Coakley who performed the first frontal sinus opera tion

About the turn of the century Killian had introduced many improved instruments which served to give impetus to laryngeal surgery Early in the 1900's Einhorn, in New York, and Ephriam Ingals, in Chicago, devised the first distally lighted instruments which were later perfected by Chevalier Jackson

As early as 1868 the first successful laryngectomy had been performed by Solis Cohen, but it was J E MacKenty, working in New York, who popularized laryngectomy and laid down solid principles for this surgery

Meanwhile, two of the most brilliant careers in the otorhinolaryngologic field had begun—that of Chevalier Jackson, about 1902, in Philadelphia, and Harris P Mosher, in Boston, about 1904

Traceable to Jackson is the universal use of endoscopy in the respira tory tract and esophagus It was Jackson who introduced perfected distally illuminated instruments using suction and having a right angle handle Noted for teaching as well as for his clinical work, Jackson *trained many men in bronchoesophagology who later achieved outstand* ing reputations in the field of laryngology

Harris P Mosher's contributions are equally important in laryngology in bronchoesophagology, in rhinology, and in otology As an educator in these fields, undoubtedly he has been more influential than anyone in this country His studies on the pathology of osteomyelitis of the frontal bone and maxilla are of enormous value In the development of tech niques for frontal sinus surgery he helped to establish the correctness of preserving intact the nasofrontal duct

Physiologic studies by Arthur Proetz in more recent years confirmed the need for conservative measures in the treatment of sinusitis after decades of radical nasal sinus surgery

In the field of allergy, pioneering work of otologists pointed the way for later developments Early in this century J L Goodale and William Scheppegrell first called attention to allergic rhinitis

It was shortly after the turn of the century, too, that the roentgeno gram became a useful tool for diagnostic and anatomic study Our knowledge and understanding of anatomy of the head and neck was greatly increased by the roentgen work of Frederick M Law

After the introduction of radium therapy, Robert Abee, in New York, was the first to make use of it in treatment of laryngeal growths Louis Clerf, in Philadelphia, formulated methods of diagnosis and indications for treatment of cancer of the larynx Paul Holinger's photographic methods greatly advanced visual education in laryngology and it was Holinger, working in Chicago, who first put forward the modern concept of visualization with stroboscopic light

As I bave mentioned elsewhere in tbis paper, there has been a dramatic reduction in the need for surgical procedures in the otorhinolaryngologic field following the history making discovery of chemotherapy and tbe antibiotics It is nevertheless true tbat unless the antibiotics are used witb discretion and proper evaluation of the clinical picture, and with due regard for the fact that the antibiotics can mask the symptoms of infec tion and convert an acute into a subacute or a chronic infection, then these wonder drugs may often complicate rather than ameliorate oto rhinolaryngological problems

An event of bigbest significance to the otorhinolaryngologic field—which came about in 1924—was the establishment of the American Board of Otolaryngology, in November of that year Among those chiefly responsible for the formation was George E Shambaugh, Sr , wbo re quested the American Laryngological Society, tbe American Otological Society, the Triological Society, the Academy of Opbthalmology and Otolaryngology, and the American Medical Association to appoint two members each Those named were T H Halstead, H W Loeb, H P Mosher, R H Skillern, Burt R Shurly, Frank Spencer, T L Carmody, W P Wherry, J C Beck, and R C Lynch The first officers of tbe Board were H P Mosher, president, Frank Spencer, vice president, H W Loeb, secretary Members of the Otological, Laryngological, and Triological Societies became the first diplomates of the Board The first examinations were held in Philadelphia in 1925 In the regulation and advancement of tbe specialty and as an educational medium, the Board undoubtedly has been the most important influence in the field in the first half of this century

Also highly significant was the founding of the American Academy of Ophthalmology and Otolaryngology which bad taken place in 1895, perhaps unique throughout the world, since the combination of otology and ophthalmology seems to be exclusively an American innovation The individual instruction and home study courses of the Academy are of the highest standards and value

It is tbrough training facilities such as those and the outstanding work of our medical schools—reflecting the progress made in American oto-

rhinolaryngology—that the United States, in recent years, has become the world center for postgraduate instruction

BIBLIOGRAPHY

1 Schwartze, H *Uber die Kunstliche Eroffnung des Warzenfortwatzes*, A F O, Bed VII, 1873

2 Ballance, C, and Duel, A B The Operative Treatment of Facial Palsy by the Introduction of Nerve Grafts into the Fallopian Canal and by Other Intratemporal Methods, Trans Amer Otol Soc, *21*, 288, 1931

3 Bárány, R *Physiologie und Pathologie des Bogengangsapparates beim Menschen*, Leipzig and Vienna, *1907*

4 Lempert, J Simple Subcortical Mastoidectomy, Arch Otolaryng, *7*, 201, 1928

5 ———— Complete Apicectomy, Arch Otolaryng, *25*, 144, 1937

6 ———— Endaural, Antauricular Surgical Approach to the Temporal Bone, Arch Otolaryng, *27*, 555, 1938

7 Wever, E G, and Bray, C W (1) Auditory Nerve Impulses, Science, *71*, 215, 1930, (2) Action Currents in the Auditory Nerve in Response to Acoustical Stimulation, Proc Nat Acad Sci, Washington, *16*, 344, 1930

8 Lempert, J Decompression Operation for Hydrops of the Endolymphatic Labyrinth in Ménière's Disease, Arch Otolaryng, *47*, 551, 1948

9 ———— Improvement in Hearing in Cases of Otosclerosis, Arch Otolaryng, *28*, 42, 1938

10 ———— The Bone-Dust-Free Fenestra Nov Ovalis, Arch Otolaryng, *47*, 280, 1948

11 ———— Fenestra Nov-Ovalis, Arch Otolaryng, *34*, 880, 1941

12 ———— Lempert Fenestra Nov-Ovalis Operation for the Restoration of Serviceable Unaided Hearing in Patients with Clinical Otosclerosis Its Present Evolutionary Status, Arch Otolaryng, *46*, 478, 1947

13 ———— An Analytical Survey of the Evolutionary Development of the Fenestration Operation, Annals Otol, Rhinol & Laryng, *59*, 988, 1950

14 ———— The Permanently Patent Fenestra Nov-Ovalis, Laryngoscope, *61*, 215, 1951

KENNETH M BRINKHOUS

~ 10 ~

PATHOLOGY

By Kenneth M. Brinkhous, M.D.

Professor of Pathology, University of North Carolina School of Medicine, Chapel Hill, North Carolina.

IN KEEPING with the theme of this volume, a brief survey of some developments in the field of pathology in the past seventy-five years is being undertaken. In this period there have been such widespread and revolutionary advances that it is difficult for the present-day physician to appreciate the status of medical knowledge and practice only two generations past. Pathology, the science concerned with the origin, nature and course of disease, has occupied a key position in the many changes in medical science and medical practice. And as with medicine generally, it is difficult even in the more limited field of pathology to envisage the changes which have occurred. It seems in order, nevertheless, to consider the state of pathology at the beginning of this period.

PATHOLOGY SEVENTY-FIVE YEARS AGO

Modern pathology in this country, like our modern graduate school,[1] found its inspiration in the German universities of the nineteenth century. Pathology in 1878 was most advanced in Germany and Austria At that time, the autopsy was used extensively in the study of disease,[2] and most of the great advances in gross descriptive pathology had already been made. Much of the knowledge thus gained had been transferred to clinical practice, particularly in surgery. Probably the greatest pathologist of the day was Rudolph Virchow, director of the Pathological Institute of the University of Berlin, and at that time fifty-seven years of age. For the most part he had already completed his creative work which has left such an imprint on medicine. He had instituted the first modern journal in pathology, *Archiv fur pathologische Anatomie und Physiologie,* and already some 75 volumes had been printed The new concepts of disease put forth in his book, *Cellularpathologie,*[3] published a score of years previously, had been made possible by the application of the microscope to the study of diseased tissues. Experimental inquiry into

At the beginning of this period, there were no independent chairs of pathology in the medical schools of the country, with the single exception of Harvard Here a chair of pathological anatomy was established the same year that the first volume of Virchow's *Archiv* appeared, 1847 This move had no obvious influence on other medical schools, in fact, there appears to have been a certain reluctance by other medical faculties to make such a change When Welch returned from Europe in 1878, he was approached by Delafield to establish a pathological laboratory at the College of Physicians and Surgeons Welch related that Delafield expected to succeed to the Chair of Medicine, and stated that "as long as I hold it, there will not be an independent Chair of Pathology "[9] The trend nevertheless was well established within a few years, and Krumhhaar[10] observed that every self respecting medical school had an independent chair for this important subject by the close of the century The stage was well set by 1900 for the rapid advances of the future

While hospital laboratories in pathology, as we know them today, did not exist, autopsies were frequently performed and many surgeons investigated the tissues removed in the operating rooms Histologic studies were frequent, Olcott[11] indicates that such examinations were made as far back as the 1850's in the New York Hospital In 1878, an independent pathological laboratory in the modern sense was set up by Welch in Bellevue Hospital in New York In Philadelphia, Osler's autopsy experience in the Pennsylvania Hospital[12] was extensive in the early 'eighties It was here that he acquired a sound pathologic basis for his further work in medicine Osler was listed as one of the first four outstanding pathologists of the country a half century ago, along with Welch, Flexner and Councilman,[13] although Osler's activities in pathology were preparatory or incidental to his great career as an internist

Pathological museums existed in a number of places in this country in 1878 The pathological cabinet (*i e*, room) of the New York Hospital had existed since early in the nineteenth century, and well kept records were maintained for many decades until the final disposition of the museum in 1901 [11] The Army Medical Museum in Washington dated from Civil War days [14] In the face of newer trends in pathology, pathological museums have been relegated to a relatively unimportant place today

PATHOLOGY AS A SCIENCE

Developments in pathology as a science since 1878 paralleled the growth of science generally Cellular pathology, both observational and experimental, and pathologic physiology had a firm foundation on which to build Bacteriology and immunology developed rapidly, often as an integral part of pathology The succeeding years represent a period of continuing search, with increasing tempo, for the cause of disease, and for the detailed sequence of events relating causes to effects, *i e*, causality

the nature of pathological phenomena was being started, and applications of advances in physiology to the study of pathology were being made It is of interest that even in 1847, when Virchow's *Archiv* first appeared, pathologic physiology was considered an essential part of pathology

From the standpoint of future developments in pathology in the United States, the influence of one of Virchow's pupils, Julius Cohnheim, was most important Cohnheim's laboratory in Breslau was an active one, in which the experimental approach to the study of pathology was empha sized His experiments on inflammation furnish the basis for current conceptions of this fundamental process, and his ideas of the origin of tumors from cell rests is to a limited extent still applicable In 1878, there were three items of particular interest which reflect the activities in this laboratory (1) Cohnheim's lectures on general pathology were first published This three volume textbook has been translated into English under the auspices of The Sydenham Society[4], and unlike most textbooks, which in a decade or so are destined for limbo, this one has become a classic and is well worth perusal even today (2) In this same year Ehrlich's doctoral dissertation of stain technique was published This work foreshadowed his demonstration a few years later that the tubercle bacillus is "acid fast" Even today Ehrlich's stable hema toxylin or a modification is widely used in staining tissue sections in laboratories throughout the world (3) It was in Cohnheim's labora- tory that William Henry Welch, often referred to as the dean of modern American medicine and America's great pioneer pathologist, did his first experimental work This work, "On the Pathology of Lung Edema," was published in 1878[5] Welch greatly valued his stimulating associa tions in the Breslau laboratory The Flexners,[6] in their brilliant biog raphy of Welch, show how important were the dynamic concepts of disease which he acquired there, and how these viewpoints influenced future developments in this country, not only in pathology but in medical education and general medical thought as well

In contrast to Europe, opportunities for the study of pathology in this country at that time were very limited There were no pathological laboratories in the modern sense in either the medical schools or the hospitals And there were few, if any, medical men who devoted whole time to pathology The well known pathologists of the day, as Samuel Gross in Philadelphia and Francis Delafield in New York, were primarily clinicians who gave special attention to pathology In spite of many limitations, some basic contributions to pathology were being made, however For example, the first clear description of the bone marrow in pernicious anemia appears to have been made by Pepper and Tyson of Philadelphia[7] In 1885, Delafield and Prudden published the first modern textbook of pathology in this country[8] With many revisions, mainly by Wood, this text has been used up to very recent times

At the beginning of this period, there were no independent chairs of pathology in the medical schools of the country, with the single exception of Harvard Here a chair of pathological anatomy was established the same year that the first volume of Virchow's *Archiv* appeared, 1847 This move had no obvious influence on other medical schools, in fact, there appears to have been a certain reluctance by other medical faculties to make such a change When Welch returned from Europe in 1878, he was approached by Delafield to establish a pathological laboratory at the College of Physicians and Surgeons Welch related that Delafield ex pected to succeed to the Chair of Medicine, and stated that "as long as I hold it, there will not be an independent Chair of Pathology "[9] The trend nevertheless was well established within a few years, and Krumb haar[10] observed that every self respecting medical school had an inde pendent chair for this important subject by the close of the century The stage was well set by 1900 for the rapid advances of the future

While hospital laboratories in pathology, as we know them today, did not exist, autopsies were frequently performed and many surgeons in vestigated the tissues removed in the operating rooms Histologic studies were frequent, Olcott[11] indicates that such examinations were made as far back as the 1850's in the New York Hospital In 1878 an independent pathological laboratory in the modern sense was set up by Welch in Bellevue Hospital in New York In Philadelphia, Osler's autopsy experience in the Pennsylvania Hospital[12] was extensive in the early 'eighties It was here that he acquired a sound pathologic basis for his further work in medicine Osler was listed as one of the first four outstanding pathologists of the country a half century ago, along with Welch, Flexner and Councilman [13] although Osler's activities in pathology were preparatory or incidental to his great career as an internist

Pathological museums existed in a number of places in this country in 1878 The pathological cabinet (*i e*, room) of the New York Hospital had existed since early in the nineteenth century, and well kept records were maintained for many decades until the final disposition of the mus eum in 1901 [11] The Army Medical Museum in Washington dated from Civil War days [14] In the face of newer trends in pathology, pathological museums have been relegated to a relatively unimportant place today

PATHOLOGY AS A SCIENCE

Developments in pathology as a science since 1878 paralleled the growth of science generally Cellular pathology, both observational and experi mental, and pathologic physiology had a firm foundation on which to build Bacteriology and immunology developed rapidly often as an integral part of pathology The succeeding years represent a period of continuing search, with increasing tempo, for the cause of disease, and for the detailed sequence of events relating causes to effects, *i e*, causality

Concomitantly with the growth of cellular pathology, the applications of increasing knowledge in chemistry and allied fields have resulted in a changing direction in patbology From feeble beginnings over a half century ago, one of the dominant themes today is an attempt to understand the developmental mechanisms and pbysiological disturbance in disease Thus altered chemical reactions in disease have become of prime importance This phase of study in pathology may be termed the molecular phase The ultimate in the study of disease would be to trace in detail the chemical reactions their exact sites in the body, whether intracellular or extracellular, and the circumstances that contribute to deviations from normal Such a happy state can hardly be said to bave been attained in any disease process Yet tbe data in the current literature bearing on the detailed elucidation of pathologic processes at the molecular level are enormous In fact, this body of material is so broad, covering nearly tbe whole spectrum of disease, that we give concurrently with our regular course for sophomore medical students at the University of North Carolina a subcourse devoted exclusively to molecular pathology

The field of tumors is one in which the application of the principles of cellular pathology has wrought a decisive influence It is also one in which the understanding of cause and effect relationsbips bas been dependent upon a broader approach often at the molecular level The cellular approach had been used in tbis group of lesions by Muller and others in the half century prior to 1878 Intensive studies over the years since that time have resulted in a detailed classification of neoplasms on the basis of their cellular make up and their histogenesis Ewing's "Neoplastic Diseases" published first in 1919, and tbe "Atlas of Pathology," being currently published by the Armed Forces Institute of Pathology,[15] furnish conclusive evidence of tbe value of morpbology in the field of tumors Karsner[16] has stated tbe general case succintly "morphology serves better than any other method for the identification of disease" While this is a truism, the widening horizons bave by and large not been revealed by this method This is indicated by observations of Ewing[17] in regard to tbe whole field of tumors "The modern student is paying more attention to he pbysiology of tumors and is thereby gaining a deeper insight into the etiology, symptomatology, diagnosis, and general biological significance of many neoplasms The study of hormones, the altruistic relations of organs, the chemistry of malignant cell growth, the action of filtrable agents, the production of tumors by specific chemical substances, and the behavior of tumor cells in cultures represent the most significant advances of the century" The work of Rous over the years, first with filtrable viruses in the initiation of malignant growth,[18] and most recently with altered cell behavior following repeated application of carcinogenic hydrocarbons, gives point to the generalizations made by Ewing, as does the pioneer work of Loeb on the importance of estrogens in carcinogenesis [19]

Examples could be multiplied to illustrate the extent to which medical thought today is based on cellular pathology and morbid anatomy And in nearly every example, one could add that the understanding of the disease process, as in the case of tumors, had extended beyond the facts adduced from morphologic study And conversely, knowledge of morphologic changes in disease have been extended by careful review of the lesions in the light of newer findings in the fields of physiology, chemistry and general pathology When properly pursued and revised in the light of such findings, it is obvious that cellular pathology will continue as a dynamic and essential part of pathology and medicine

Molecular pathology is an outgrowth of experimental general pathology Early activity in this field in the United States can be found in the late nineteenth century The progressing forefront of thought in pathology is indicated by the work of Welch and Flexner in 1892 [20] when they described the experimental production of lesions resulting from the toxin of the diphtheria bacillus It is of interest that work in this field culminating in the development of antitoxins against diphtheria and tetanus, led to the award of the first Nobel prize in Physiology and Medicine in 1901 to Emil von Behring of Germany

By the turn of the century the trend toward molecular pathology was well established This is well seen in the series of studies on the pathogenesis of fat necrosis by several pathologists, notably Flexner Opie and Wells [21] The importance of proteolysis by trypsin as an antecedent to the splitting of fats by lipase was clearly shown Little has been added to these fundamental studies in the succeeding decades The early achievements in the study of disease at the molecular level can be reviewed in one of the outstanding textbooks of that time—Wells *Chemical Pathology* [21]

Similar advances have occurred with increasing rapidity Only a few which have become a part of general medical thinking and practice need be mentioned The outstanding work of Whipple and his associates on the metabolism of hemoglobin both in health and disease resulted in the recognition of this eminent American pathologist by the Nobel prize committee in 1934, along with the clinical investigators Minot and Murphy Other studies in Whipple's laboratory have dealt with the metabolism of plasma proteins and of iron From the latter studies has developed the association of the chromogen, apoferritin, with iron absorption,[22] along with possible relationships to iron deficiency and particularly to states with excessive iron deposition Another example is seen in the relationship of bacterial growth and bile salts to the synthesis and absorption of naphthoquinones with vitamin K activity It was shown that this vitamin is needed for the elaboration by the liver of a plasma protein prothrombin, required for normal clotting and hemostasis These findings have clarified the sequence of events between such

Concomitantly with the growth of cellular pathology, the applications of increasing knowledge in chemistry and allied fields have resulted in a changing direction in pathology From feeble beginnings over a half century ago, one of the dominant themes today is an attempt to understand the developmental mechanisms and physiological disturbance in disease Thus altered chemical reactions in disease have become of prime importance This phase of study in pathology may be termed the molecular phase The ultimate in the study of disease would he to trace in detail the chemical reactions their exact sites in the body, whether intracellular or extracellular, and the circumstances that contribute to deviations from normal Such a happy state can hardly be said to have been attained in any disease process Yet the data in the current literature hearing on the detailed elucidation of pathologic processes at the molecular level are enormous In fact, this hody of material is so broad covering nearly the whole spectrum of disease, that we give concurrently with our regular course for sophomore medical students at the University of North Carolina a suhcourse devoted exclusively to molecular pathology

The field of tumors is one in which the application of the principles of cellular pathology has wrought a decisive influence It is also one in which the understanding of cause and effect relationships has been dependent upon a hroader approach, often at the molecular level The cellular approach had been used in this group of lesions hy Müller and others in the half century prior to 1878 Intensive studies over the years since that time have resulted in a detailed classification of neoplasms on the hasis of their cellular make up and their histogenesis Ewing's "Neoplastic Diseases" puhlished first in 1919, and the "Atlas of Pathology," heing currently puhlished by the Armed Forces Institute of Pathology,[15] furnish conclusive evidence of the value of morphology in the field of tumors Karsner[16] has stated the general case succintly

> morphology serves better than any other method for the identification of disease" While this is a truism, the widening horizons have by and large not been revealed by this method This is indicated by observations of Ewing[17] in regard to the whole field of tumors "The modern student is paying more attention to he physiology of tumors and is thereby gaining a deeper insight into the etiology, symptomatology, diagnosis, and general biological significance of many neoplasms The study of hormones, the altruistic relations of organs, the chemistry of malignant cell growth the action of filtrable agents, the production of tumors by specific chemical substances, and the behavior of tumor cells in cultures represent the most significant advances of the century"

The work of Rous over the years, first with filtrable viruses in the initiation of malignant growth,[18] and most recently with altered cell behavior following repeated application of carcinogenic hydrocarbons, gives point to the generalizations made by Ewing, as does the pioneer work of Loeb on the importance of estrogens in carcinogenesis [19]

Examples could be multiplied to illustrate the extent to which medical thought today is based on cellular pathology and morbid anatomy And in nearly every example, one could add that the understanding of the disease process, as in the case of tumors, had extended beyond the facts adduced from morphologic study And conversely, knowledge of morphologic changes in disease have been extended by careful review of the lesions in the light of newer findings in the fields of physiology, chemistry and general pathology When properly pursued and revised in the light of such findings, it is obvious that cellular pathology will continue as a dynamic and essential part of pathology and medicine

Molecular pathology is an outgrowth of experimental general pathology Early activity in this field in the United States can be found in the late nineteenth century The progressing forefront of thought in pathology is indicated by the work of Welch and Flexner in 1892,[20] when they described the experimental production of lesions resulting from the toxin of the diphtheria bacillus It is of interest that work in this field, culminating in the development of antitoxins against diphtheria and tetanus led to the award of the first Nobel prize in Physiology and Medicine in 1901 to Emil von Behring of Germany

By the turn of the century the trend toward molecular pathology was well established This is well seen in the series of studies on the pathogenesis of fat necrosis by several pathologists, notably Flexner, Opie and Wells[21] The importance of proteolysis by trypsin as an antecedent to the splitting of fats by lipase was clearly shown Little has been added to these fundamental studies in the succeeding decades The early achievements in the study of disease at the molecular level can be reviewed in one of the outstanding textbooks of that time—Wells *Chemical Pathology*[21]

Similar advances have occurred with increasing rapidity Only a few which have become a part of general medical thinking and practice need be mentioned The outstanding work of Whipple and his associates on the metabolism of hemoglobin, both in health and disease resulted in the recognition of this eminent American pathologist by the Nobel prize committee in 1934, along with the clinical investigators Minot and Murphy Other studies in Whipple's laboratory have dealt with the metabolism of plasma proteins and of iron From the latter studies has developed the association of the chromogen, apoferritin, with iron absorption,[22] along with possible relationships to iron deficiency and particularly to states with excessive iron deposition Another example is seen in the relationship of bacterial growth and bile salts to the synthesis and absorption of naphthoquinones with vitamin K activity It was shown that this vitamin is needed for the elaboration by the liver of a plasma protein, prothrombin, required for normal clotting and hemostasis These findings have clarified the sequence of events between such

at the Johns Hopkins Hospital and Medical School early in this period Here were trained, wholly or in part, such notable pathologists as Flexner, MacCallum, Whipple of the University of Rochester, Opie, recently of Cornell, and Rous of the Rockefeller Institute for Medical Research Since that time, many other laboratories, equally outstanding, have been developed in many medical centers Today we find approved training centers in pathology, not only in the medical schools with their associated hospitals but also in many general and community hospitals throughout the country This expansion is shown by comparing the first list of laboratories approved for training in pathology, published in 1927,[28] with later lists In 1927, there were 89 laboratories listed The majority of approved sites of training were in university hospitals, or in hospitals closely allied with medical schools When the American Board of Pathology was organized in 1936 to certify pathologists meeting certain minimum standards of training, there were only about 100 services on the approved list, providing about 150 positions for training[29] Contrast these numbers with the number of laboratories approved for training today—337, more than a threefold increase in the last fifteen years[30] These statistics probably more than any others indicate the extent to which pathology has expanded in this country in recent times

Residency training in pathology does not have the set pattern often seen in other services In some places training is largely accomplished by the study of pathologic materials and patient problems presented to the laboratory daily This type of study is basic, but alone is usually inadequate In fact, too heavy a burden of routine hospital duties is inimical to the development of critical minded specialists in pathology In many residency programs, particularly in the larger centers, teaching and research activities are emphasized Both serve as superior vehicles for training The individual in training in pathology often finds that the course work obtained as a premedical student in physics, chemistry, biology and mathematics proves to be inadequate for his needs in either research or practice In several institutions provision is made for further study in the basic physical and biological sciences during the period of residency training

Today we find pathologists occupying diverse positions in medicine They may vary from the full time investigator in research institutes to the practicing pathologist with an independent laboratory in an office building Most pathologists however, are closely connected with the practice of medicine in a hospital World War II probably had as great an impact on the practice of pathology in this country as any event in recent times The well-equipped military laboratory operated by the pathologist, emphasized the importance of such services to the everyday practice of medicine at all levels, whether in the office, the small hospital or the large medical center The need for the extension of pathologic

services to nearly every facet of medical practice has resulted in an almost insatiable demand for pathologists at the present time.

SUMMARY

The continued growth of pathology as a science and as a medical specialty is heavily dependent upon the caliber of young physicians attracted to the field. A recent study made at Stanford University has indicated that those physicians who chose a career in pathology have basic interests and motivations that would lead them to consider internal medicine and psychiatry as alternates Those who chose pathology had more intense interests in chemistry than did those who chose internal medicine, while those who chose psychiatry often tended to have a greater interest in public administration. Vischer in his study of eminent scientists[13] has shown that the early formative years of the middle teens are the ones in which individuals destined to become great decide upon their special field of study. An exception to this generalization is pathology, where such a decision is not made until the twenties, or even later. This is accounted for no doubt by the lack of general appreciation of the role of pathology in medicine, and the lack of even rudimentary knowledge about the nature of the subject by most high school and college students Not until well along in his professional training is the medical student made fully aware of the subject. Recent statistical data indicate that the practicing pathologist has become one of the best remunerated specialists in medicine,[11] and that pathologists enjoy the best longevity record of any group of physicians.[12] Neither of these findings appears to have changed to any extent the ideas of medical students, developed earlier and at a more impressionable age, regarding the choice of a field in medicine Certainly there is no question that pathology, either as a science or in practice, offers a strong challenge to the highest intellect and imagination, over an extremely broad range of problems in disease.

BIBLIOGRAPHY

1 Flexner, A *Universities, American, English, German*, London, Oxford University Press, 1930
2 Schmeisser, H C, and Scianni, J L The History of the Autopsy, J Techn Methods, *15*, 26, 1936
3 Virchow, R *Cellularpathologie*, Berlin, 1858
4 Conheim, J *Lectures on General Pathology*, 3 vols, London, The New Sydenham Society, 1889–1890
5 Welch, W H Zur Pathologie des Lungenodems, Arch path Anat, *72*, 375, 1878
6 Flexner, S, and Flexner, J T *William Henry Welch and the Heroic Age of American Medicine*, New York, The Viking Press, 1941
7 Pepper, W, and Tyson, J Die Beteiligung des Knochenmarkes bei pernicioser Anamie, Arch path Anat, *71*, 407, 1877

8 DELAFIELD, F, and PRUDDEN, T M *A Handbook of Pathological Anatomy and Histology*, New York, W Wood & Co, 1885
9 *William Henry Welch at Eighty*, ed V. C Freedburg, New York, Milbank Memorial Fund, 1930, pp 68–69
10 KRUMBHAAR, E B *Pathology*, *"Clio Medica,"* XIX, New York, Paul B Hoeber, Inc, 1937
11 OLCOTT, C T The Pathological Cabinet of the New York Hospital, Ann M Hist, *8*, 54, 1936
12 LANDIS, H R M The Pathological Records of the Blockley Hospital, Sir William Osler Memorial Number, ed M E Abbott, Intern Assn Med Museums, Bull No IX, Montreal, Canada, 1927, pp 234–239
13 VISCHER, S S Scientists Starred 1903–1943, In *American Man of Science*, Baltimore, The Johns Hopkins Press, 1947, pp 133, 526
14 ASH, J E Wartime Army Medical Laboratory Activities, Am J Pub Health, *37*, 815, 1947
15 *Atlas of Tumor Pathology*, Armed Forces Institute of Pathology, Washington, D C, 1949
16 KARSNER, H T Pathology, Old and New, Bull New York Acad Med, *22*, 371, 1946
17 EWING, J *Neoplastic Diseases*, Philadelphia, W B Saunders Co 1941, p 8
18 ROUS, P A Transmissible Avian Neoplasm (Sarcoma of the Common Fowl), J Exper Med, *12*, 696, 1910
19 LOEB, L The Significance of Hormones in the Origin of Cancer, J Nat Cancer Inst, *1*, 169, 1940
20 WELCH, W H, and FLEXNER, S The Histological Lesions Produced by the Tox-Albumen of Diptheria, Bull Johns Hopkins Hosp, *3*, 17, 1892
21 WELLS, H G *Chemical Pathology*, Philadelphia, W B Saunders Co 1907
22 HAHN, P F, BALE, W F, ROSS, J F, BALFOUR, W M, and WHIPPLE, G H Radioactive Iron Absorption by Gastro-Intestinal Tract, J Exper Med, *78*, 169, 1943
23 SMITH, H P, and WARNER, E D *Vitamin K Clinical Aspects*, *The Biological Action of the Vitamins*, A Symposium, ed E A Evans, Jr, Chicago, The Chicago University Press, 1943, pp 211–227
24 BRINKHOUS, K M Plasma Prothrombin, Vitamin K, Medicine, *19*, 329, 1940
25 CORI, G T, and CORI, C F Glucose-6-Phosphatase of the Liver in Glycogen Storage Disease, J Biol Chem, *199*, 661, 1952
26 GRAHAM, J B, MCLENDON, W W, and BRINKHOUS, K M Mild Hemophilia An Allelic Form of the Disease, Am J Med Sci, *225*, 46, 1953
27 COONS, A H The Cellular Fate of Injected Antigens, Symposia of the Society for Experimental Biology, No VI, Structural Aspects of Cell Physiology, 1952
28 "Hospitals Approved for Residencies in Specialties," J A M A, *88*, 829, 1927.
29 ——— J A M A, *109*, 693, 1937
30 "Annual Report of Internships and Residencies," J A M A, *150*, 275, 1952
31 WEINFELD, W Income of Physicians, 1929–49, U S Department of Commerce, Survey of Current Business, *31*, 9, 1951
32 DUBLIN, L I, and SPIEGELMAN, M Mortality of Medical Specialists, 1938–1942, J A M A, *137*, 1519, 1948

IRVINE McQUARRIE

~ 11 ~

PEDIATRICS

By Irvine McQuarrie, A B , Ph D , M D

Professor and Head of the Department of Pediatrics, University of Minnesota Medical School, Minneapolis, Minnesota

PEDIATRICS, as a special field of medical science and practice, had its inception during the early years of the immensely important period being commemorated today Being less encumbered by the estab lished traditions and prejudices of a prescientific era than the older medical disciplines, this new specialty with its many challenges and wide horizons stood to be an immediate beneficiary of nearly every major advance to be made subsequently in the basic fields of micro biology, physiology and biochemistry, which were just beginning their phenom enal development at the time

Pediatrics is no longer regarded as a narrow medical specialty confined to the diagnosis and treatment of childhood diseases alone It is more appropriately defined today as the division of medical science and prac tice which deals with all aspects of the physical, mental and emotional health of humankind throughout the entire period of infancy, childhood and adolescence The primary differences between this and the other medical specialties are, first, that pediatrics is concerned with the whole person instead of a single organ system or a particular region of the body second, that it deals with subjects who are undergoing continuous change of a developmental nature The phenomena of growth and development with their peculiar conditioning of, or impact on every health problem encountered, constitute the main justification for setting pediatrics apart as a special medical discipline In the practice of pediatrics more empha sis is placed upon the preventive than upon the purely reparative or curative aspect of the patient's health problems almost the sole concern of the practitioner who deals with adults

In order more fully to comprehend the true significance of major achievements in the field of pediatrics during the period under con sideration, one should be fully cognizant of the primitive status of medical service to children in the most advanced countries of the world only three quarters of a century ago An even more impressive means of

emphasizing the degree of change during the period would be that of comparing health conditions today in the medically progressive centers of the world with those in backward areas which have remained entirely untouched by the Muse of modern medical science It may be accepted as a general rule that the infants and young children in any population group suffer more severely than adults, wherever and whenever pestilence, ignorance, backwardness or disaster in any form exists Medical history abounds with tragic examples to substantiate this declaration

Systematic progress in the care of children was greatly retarded in all parts of the world during the prescientific era primarily by lack of essential scientific information To a minor extent, however, its development was inhibited also by the attitude of the medical profession itself toward the important differences which exist between very young or immature individuals and adults Until early in the twentieth century the infant or young child was regarded by all but the exceptional physician as a "*miniature adult,*" having the same degree of susceptibility to diseases and the same nutritional and other health requirements as the adult, size for size

Knowledge of the elemental principles of human growth and development was all but nonexistent until the very turn of the century, when one of America's pioneer physiologists, William Townsend Porter, published the results of his research on the subject of physical growth of children Likewise, no exact information regarding the special requirements for normal nutrition in infancy and childhood was to become available to practicing physicians for a quarter of a century or more after the opening of the period under discussion It was then that Eijkman, Dutch physiologist, working in the Orient, discovered the first vitamin, a lack of which he proved to be responsible for the disease, beriberi At approximately the same time Heubner, a physiologist, and Rubner, a pediatrician, initiated scientific investigations on the subject of the energy requirements in infants and children, but their limited results were not at once available for use in infant feeding Knowledge concerning the physiology of human digestion, which had accrued from Beaumont's classical experiments on Alexis St Martin fifty years previously, had not yet found application in clinical practice among children, when the nineteenth century closed

In the year 1878 the sciences of microbiology and immunology were still in their early embryonic stage and had not as yet been put to crucial tests in the human subject Lister, Pasteur and Koch, illustrious contemporaries had just begun to arouse keen medical interest in their demonstration that infectious diseases are caused by specific microorganisms Lister had proved the efficaciousness of chemical antisepsis and Pasteur had shown that living micro-organisms can be destroyed by heat (pasteurization) The latter had barely initiated laboratory studies which were shortly thereafter to demonstrate that specific immunity to

certain infectious diseases could be induced by killed or attenuated living causative bacteria or their metabolic products Jenner's magnificent contribution on smallpox vaccination had anticipated these studies on immunity by a full century, but the nature of the causative virus and the mechanisms involved in the development of specific immunity were not investigated by his immediate followers Specific serological reactions and skin tests for use in diagnosis of various infectious diseases were yet to be discovered Physiological chemistry, as applied to clinical medicine, was in its infancy Roentgen was not to discover the *x* ray (1895) and its invaluable use in diagnosis for nearly a quarter of a century after the opening of the period

There is little wonder then that the field of pediatrics, which is so peculiarly objective in character and so manifestly dependent upon application of the basic principles of science for its development, was not organized as a full fledged special branch of medical practice in America or elsewhere until near the noon-day of the "golden age of discovery," in the latter decades of the nineteenth century

As a result of the comparatively primitive state of medical knowledge and practice in the eighth decade of the last century, it is doubtful whether the medical profession exerted any significant net influence on the morbidity or mortality among infants and young children at the time Records on vital statistics for the large cities of Europe and America show a similar pattern of astonishingly high mortality rates among the very young

Reliable official lists of live births and burials indicate that the infant mortality rate (number of deaths occurring during the first year of life per 1000 live births) varied between 250 and 500 The rates were at their maximum among artificially fed babies confined in foundling homes, between 75 and 90 per cent of such babies dying within their first year Some metropolitan records showed that more than half of the total deaths, which occurred in the average community from all causes, were in children under five years of age and three fourths of the total were in children under twelve years of age[1] These high mortality rates among the very young account in large measure for the comparatively short average life span (thirty five to thirty-eight years) during the later decades of the nineteenth century Presumably, the morbidity rates of the time, for which adequate records are not available, were extremely high Enteric disorders, malnutrition, and the common respiratory and contagious diseases constituted the major causes of death Such was the status of child health preceding the last two decades of the nineteenth century

The accelerated rate of scientific discovery which manifested itself at this time led to a veritable renaissance in medicine Largely as a result of the unprecedented application of the scientific method to the study of clinical problems, in the laboratory as well as in the clinic, pediatrics finally emerged as a fledgling branch of scientific medicine during the

waning decades of the century, less fettered by accumulated misinformation and more ready to adopt new concepts than were the long established clinical specialties A few progressive physicians, with discerning insight into the serious plight of young children at the time, took up the challenge and organized themselves into special societies for the purpose of promoting child welfare in all of its aspects The American Pediatric Society was founded in this atmosphere in 1888 During the same year, the first independent university department of pediatrics in the United States was organized for formal teaching of the subject at Harvard University

In the following delineation of the major advances in the field of pediatrics only those are considered which pertain peculiarly to the problems of growth and development or to disease states which affect children most characteristically or most severely, because of the factor of immaturity Despite such limitations the list appears like a veritable compendium of medical progress because of the breadth of the field

The most notable of the achievements may be enumerated as follows

1 The development of the science of human growth and development and the establishment as a result, of special departments of pediatrics in medical colleges and of pediatric societies to emphasize the subject matter and special techniques of the field and to foster research pertaining to the health and welfare of children
2 The mass application of fundamental data from the sciences of microbiology and sanitary engineering to eradicate or bring under control the diarrheal or enteric diseases and insect borne diseases so devastating to young children
3 Elimination of digestive and dietary deficiency diseases by efficient application of the science of nutrition
4 Introduction of rational procedures for the parenteral administering of electrolytes and nutritive solutions as well as blood, for repair of depletion and shock states
5 Development of successful wide scale programs for greatly reducing the incidence of congenital syphilis and gonorrheal ophthalmitis in the newborn
6 Organization of effective programs for reducing the incidence of childhood tuberculosis
7 Elucidation of the problems of erythroblastosis fetalis
8 Successful prevention of diphtheria, tetanus, whooping cough and typhoid fever by prophylactic use of specific toxoid and bacterial antigens
9 Successful use of specific serums, sulfonamide drugs and antibiotic agents in the treatment of various acute infectious diseases heretofore so prevalent in childhood
10 Numerous advances in endocrinology of infants and children

11 Development of pneumoencephalography, electroencephalography, and other special procedures which throw light upon the pathogenesis and aid in the diagnosis and therapy of the common convulsive disorders of children

12 Extensive refinement of technical methods for diagnosis and treatment of congenital malformations of the cardiovascular system

In the following brief review of these achievements in pediatrics it will be necessary to omit mention of the many persons who have been responsible for the contributions listed Also for lack of space, many achievements of great promise cannot be included because they are incomplete

GROWTH AND DEVELOPMENT OF CHILDREN

One of the most fundamental though the least spectacular, achievements of the period was the acquisition of an extensive body of scientific knowledge pertaining to the phenomena of growth and unfolding of the whole human organism, physical, mental and emotional Cataloguing the orderly changes in children from period to period in quantitative terms for numerous individuals provided reliable standards and patterns of growth and development which may be used to detect and appraise deviations from the normal with a comparatively high degree of accuracy

The development and expansion of independent departments of pediatrics in medical colleges and the multiplication of special professional and lay organizations with progressive educational and child welfare objectives were parallel developments of an almost equal significance for safeguarding the child's health

CONTROL OF ENTERIC AND INSECT BORNE DISEASES

The most spectacular accomplishment from the viewpoint of reducing the previously high mortality rate in children was that resulting from the discovery of a relationship between contamination of water and food supplies, including milk with pathogenic micro organisms and the occurrence of enteric or diarrheal diseases in infants and young children In no other major area has cooperation between private practitioners public health officials and voluntary lay organizations accomplished so much as it has in eliminating food and water contamination on a community wide basis Enactment and strict enforcement of pure food laws governing production preservation and distribution of milk and other foods was supplemented by the establishment of clean milk stations and infant welfare clinics where parents were given demonstrations and instruction so essential for a preventive medical care program As a result of such health programs mortality rates for infants and young children decreased most strikingly wherever they were put into practice

In areas which are endemic for certain diseases, such as malaria, typhus fever and kala azar, which are spread by insect vectors, almost equally spectacular advances were made It was demonstrated on a smaller scale that control is possible by eradication of the vectors with DDT (dichlorodiphenyl trichloroethane) sprays and other means on a community wide basis This procedure in conjunction with the newly perfected specific chemotherapy for each of these diseases is capable of reducing sickness and mortality among children in such areas very strikingly where the knowledge is applied efficiently

DIGESTIVE AND DIETARY DEFICIENCY DISEASES

Of the many advances made in the medical care of infants and young children, none have been more important than those pertaining to mal nutrition Even primitive man recognized the importance of breast feeding versus artificial nurture for survival of young infants The unsatisfactory results of artificial feeding of newborn infants, especially prematures were admitted by all physicians up to approximately the end of the first quarter of the present century The major fraction of every pediatrician's practice theretofore was devoted to the problems of artificial feeding, to the search for a formula that might be substituted for human milk "Wet nursing" registries and human milk stations were organized in the large population centers, but these were woefully inadequate even under the best conditions Unmodified raw milk from other animal sources proved to "upset digestion" while highly diluted cow's milk formulae failed to produce acceptable weight gains So, most elaborate milk modifications were compounded and sick infants were frequently shifted from one to another without benefit Acute infection often ensued Many babies had severe vomiting and diarrhea with attendant dehydration, inanition and acidosis Without adequate replacement of water and electrolytes lost in the course of such an illness, infant mortality among these babies was extremely high

With the advent of greatly improved sanitation and hygiene and the practice of boiling cow's milk formulae before use, as well as adding carbohydrate and vitamins (A, D, C, and the B complex) the entire picture changed Artificially fed babies began to thrive and the mortality rates decreased precipitately to one fourth of their former levels as the important factors of infection, inanition and vitamin deficiencies were eliminated No longer were such disease entities as hypoproteinemic edema, scurvy, rickets, rachitic tetany, vitamin A deficiency, beriberi, pellagra arriboflavinosis and the vitamin B macrocytic anemias (folic acid B_{12}) and iron deficiency anemia inevitable in the child population The nutritional status of infants and children has improved so vastly that new standards of height and weight for age may need to be established for future use

PARENTERAL ADMINISTRATION OF ELECTROLYTE AND NUTRITIVE SOLUTIONS IN DEPLETION STATES

Closely related to the progress achieved in the prevention of digestive and dietary deficiency diseases in infants and children is that concerning *the active therapeutic use of measures for correcting* or *repairing dis* turbances of homeostasis already existing as a result of privation or special losses

Acquisition of accurate information regarding the characteristic com positions and quantitative inter relationships of constituents of the intracellular and extracellular body fluid compartments and the rates of their turnover at various ages, under both normal and abnormal con ditions, has been a most important contribution to the field of pediatrics This basic information made it possible to estimate the extent of deficits of water and the various electrolytes, as well as blood proteins, in different depletion states which are so common and so serious in sick infants

Following severe vomiting, diarrhea and inanition, losses of water and electrolytes produce extreme dehydration and electrolyte deficits with disturbances in acid base balance Potassium depletion may be par ticularly harmful to cardiac function and to the activity of various enzyme systems Diabetic acidosis and coma indicate extreme depletions of water and electrolytes which must be replaced

Many of the physiological factors involved in the regulation of body fluid and electrolyte exchanges under a wide variety of conditions are now clearly understood, as a result of extensive clinical research on the problem during the past twenty five years Application of this informa tion by means of greatly improved technical procedures and special solutions is now employed daily as an effective, lifesaving measure in all hospitals and clinics for children Intravenous administration of nutrient solutions such as whole blood or plasma glucose, amino acids, vitamins and even emulsions of fat, is now feasible and is resorted to frequently, whenever feeding by way of the gastrointestinal tract is considered to be impossible or undesirable for any reason over a protracted period of time

CONGENITAL SYPHILIS

Congenital syphilis was a widespread and destructive affliction among infants and children before the turn of the present century This form of the disease was considered to be the example, *par excellence*, of ' the sins of the parents being visited upon their children " With the introduction of therapeutically effective organic arsenical compounds for individual treatment in systematic courses, the outlook for affected children was immensely improved Still, the long course of painful treatments and delays in initiating the same frequently militated against complete suc cess

A great forward step was taken when it was demonstrated that the congenital form of the disease could be successfully prevented by treating a mother, who was afflicted with it, intensively throughout the course of her pregnancy The legal requirement of premarital examination and the requirement that blood serum tests be made routinely on every pregnant woman to determine the presence or absence of syphilis was one of the most valuable of all contributions to maternal and child health This program has resulted in virtual disappearance of congenital syphilis in those parts of the world where the program was applied universally

The excessive prevalence of gonorrhea among women of childbearing age in the prescientific period was responsible for numerous cases of gonorrheal ophthalmitis in their infants contracted at the time of birth From one infected infant this highly contagious disease often spread to others in the same hospital nursery or to other members of a family by direct contamination, often with disastrous results Introduction of the Credé method of prophylactic instillation of weak silver nitrate solution routinely in the eyes of every baby at the time of birth greatly reduced the incidence of blindness from this disease The routine treatment of all cases of gonorrhea with sulfonamide and antibiotic drugs has reduced this affliction in infants almost to the vanishing point in areas where such treatment is applied on a large scale

TUBERCULOSIS

The great prevalence of pulmonary, gastro intestinal, skeletal, glandular and meningeal tuberculosis in children presented an extremely common and serious health problem in all communities of the world during the last generation In many parts of the world today, it offers the most serious challenge of all of the chronic diseases involving children Yet effective means for its control have been discovered and in some parts of the western world its incidence has been reduced almost to the vanishing point by application of the acquired information

Greatly improved general public sanitation, together with community wide programs of case findings by means of tuberculin tests and mass chest x rays, followed by isolation of open cases so discovered, has resulted in vast improvement Destruction of tuberculous milk cows and the boiling of milk have played a role in some European countries in reducing morbidity and mortality Direct therapy of tuberculosis, including heretofore hopeless tuberculous meningitis, by antibiotic and accessory therapy has achieved very striking results in numerous cases However, this phase of progress toward solution of the problem of childhood tuberculosis remains to be perfected

ERYTHROBLASTOSIS FETALIS

Erythroblastic hemolytic anemia of the newborn, icterus gravis and hydrops fetalis serious disease states, manifesting themselves at or

shortly after birth, not infrequently resulted in a high rate of mortality or a high incidence of spasticity and feeble mindedness in surviving victims When it was determined that these disorders do not represent three separate diseases but different aspects of the same pathological entity, a big forward step was made

The discovery that the disorder is the result of a certain incompatibility between the blood types of the mother and her fetus (Rh negative mother, Rh positive fetus or infant), control or prevention became possible by application of genetic laws to prevent incompatible marriages or palliative treatment such as replacement transfusions, when an affected infant is born

DIPHTHERIA, TETANUS, WHOOPING COUGH AND TYPHOID FEVER

Perhaps the most immediately impressive achievement of science, as applied to childhood disease next to that of smallpox vaccination, was that of devising procedures for preventing these serious diseases by stimulating normal children to fabricate their own specific immunity against them Diphtheria, which was still one of the most prevalent and most serious of all diseases at the beginning of the period being discussed here (mortality as high as 60 per cent in some epidemics), exemplifies the steps by which scientific investigators have conquered infectious diseases in general The causative micro organism B diphtheria, was discovered in 1883 The toxin, antitoxin and toxoid were then described in turn and the Schick skin test for susceptibility was devised Antitoxic serum was used successfully to treat countless numbers of children who contracted the disease The final triumph was the use of diphtheria toxoid in harmless doses, as a public health measure to immunize all infants and young children against the disease It is now a rarity in those communities which maintain immunization programs

The control over tetanus or lockjaw was just as effective once the immunization program with tetanus toxoid was adopted Immunization against typhoid paratyphoid fevers and pertussis or whooping cough by fractional injections of killed cultures of the specific causative bacteria has been almost as successful millions of lives being saved annually by these procedures

ANTISERA, SULFONAMIDE DRUGS AND ANTIBIOTIC AGENTS

The advances in specific therapy brought about by the production of diphtheria antitoxin, tetanus antitoxin type specific meningococcus serum and H influenza serum were notable, but these have largely been superseded by subsequent developments As already noted more

emphasis is now placed upon preventing diphtheria and tetanus entirely The therapeutic use of sulfonamide drugs and antibiotic agents has replaced the serums for the other diseases

Human convalescent serum or pooled human gamma globulin has continued to be used, however, for prevention or modification of measles after a young child has been exposed to this highly contagious disease

The most fundamental and far reaching therapeutic achievement of the entire jubilee period followed the introduction of the sulfonamide drugs and the antibiotics (penicillin, aureomycin, streptomycin, etc) Many acute infectious diseases, which were responsible for enormous suffering and innumerable deaths in infants and children each year less than two decades ago, are now curable through proper use of these new therapeutic tools Formerly every children's hospital or ward had its large quota of fatalities each year from pneumonia, empyema, peritonitis pansinusitis, osteomyelitis, endocarditis, and meningitis due to various types of pathogenic bacteria Now, these scourges of infants and children no longer "strike terror to the heart" of the physician and surgeon Millions of lives of children are saved annually by such treatment

ENDOCRINOLOGY

Up to approximately three decades ago, it was extremely rare for any individual who developed diabetes mellitus during childhood to reach maturity Most diabetics under twelve years of age died within less than five years, despite the best diabetic diets that could be provided for them That was because of the natural severity of this endocrine metabolic disorder in children and because of their high nutritional requirements compared to their impaired power of assimilation Extremely young children were expected to live for less than a year after signs of diabetes manifested themselves

Then came the isolation and chemical purification of the blood sugar reducing hormone, insulin extracted from the pancreas of lower animals The dramatic success that followed its use in diabetic children was immediately hailed as one of the greatest of man's triumphs over disease Now hundreds of thousands of such patients are able to live useful lives

Cretinism and hypothyroidism of lesser degrees were early observed to cause marked failure of physical, mental and emotional growth and development in infants and young children Therefore, the discoveries that these states were due to lack of a hormone produced by the thyroid gland and that extracts from thyroid glands of normal animals sufficed to make up the hormonal deficiency, were of great moment This was the first genuine demonstration of effective hormone therapy

The thyroid hormone and those from other endocrine glands have since been identified chemically and many of them have been synthesized Their uses in therapy, specific or otherwise, are of great importance in

clinical medicine and laboratory work. Those most used in addition to insulin and thyroid extract are adrenal cortical hormones (*e g*, cortisone and desoxycorticosterone acetate) in Addison's disease and in congenital pseudohermaphroditism with excessive production of adrenocortical androgens (cortisone), and in rheumatoid arthritis and rheumatic fever (cortisone), parathyroid hormone in hypoparathyroid tetany, pituitary extract (Pitressin) for diabetes insipidus, estrogen, progesterone and androgens for deficiencies in female gonadal or male gonadal functions respectively and anterior pituitary hormones for pituitary deficiencies, *e g*, gonadotropic hormone for hypogonadism and adrenocorticotropin for hypoglycemia, allergic disorders and collagenous diseases in children.

CONVULSIVE DISORDERS

Convulsive disorders occur far more frequently in children than in adults because of the greater susceptibility in the young. One authority on the subject found the incidence of seizures in children under six years of age to be 25 times that among fully mature individuals.

The primary cause varies considerably with age. In early infancy, birth injuries and congenital abnormalities of the brain are the most important. In later infancy and early childhood, intracranial and extracranial infections, head injuries with intracranial hemorrhage, poisoning and nutritional or metabolic disturbances (infantile tetany, hypoglycemia) cause convulsions with greater frequency. In children over four years of age, acute infection is still important but acute nephritis, lead poisoning, brain tumors, spontaneous hypoglycemia and epilepsy become the most frequent causes.

The most significant scientific achievement of the period as regards convulsive disorders was the development of the science and art of electroencephalography. This development provided an invaluable aid in diagnosis and in localization of brain lesions when present. At the same time the electroencephalogram supplied important information concerning the electrical nature of the disturbance in brain function in relation to seizure activity. A fairly high degree of correlation was found between the type of clinical seizure and the electrical wave pattern in the electroencephalogram.

The older diagnostic procedure, pneumoencephalography, is useful in determining the existence of atrophy or organic lesions or calcification in the brain. The superhydration test (Pitressin test) was found to be of value as a diagnostic procedure and added to our understanding concerning the nature of epilepsy. A positive test (induced seizure) indicates a defect in the epileptic's response to the stress of forced dilution of extracellular body fluid by Pitressin and water drinking. Serum calcium determinations demonstrated that convulsions result from hypocalcemia in the course of rickets or hypoparathyroidism. Severe spontaneous

hypoglycemia from various causes was likewise found to be the cause of convulsions in many patients

With the advent of effective prophylactic methods and therapy for many of the common acute infectious diseases of childbood, the incidence of convulsions decreased sharply Rickets prevention was so effective that infantile tetany due to low blood calcium practically disappeared as a problem

Hormone therapy for endocrine disorders which produce convulsive reactions is highly effective in reducing the incidence of convulsions from this cause Examples of such clinical disorders are hypoparathyroidism (hypocalcemic state) and various hypoglycemic states such as true hyperinsulinism, due to tumor or hyperplasia of the islets of Langerhans, hypothyroidism, hypocorticoadrenalism, hypopituitarism, hepatic insufficiency (glycogen storage disease) and idiopathic hypoglycemia

Children suffering from chronic convulsive disorders of unknown cause ("idiopathic" epilepsy) and those with recurrent seizures associated with demonstrable brain damage (organic epilepsy) have had their lot in life immensely improved by modern forms of therapy Such therapy consists of antiepileptic drugs, special ketogenic diets and improvement in mental hygiene Seizures can now be prevented in at least 80 per cent of juvenile epileptics by these means Some patients with organic brain lesions are greatly benefited by surgery

CONGENITAL ANOMALIES OF THE HEART AND BLOOD VESSELS

Cardiovascular diseases in early life are divisible into two main categories the congenital anomalies and rheumatic carditis Advances concerning the latter have been referred to in another chapter Among the medical achievements of the past two decades none have been more spectacular or more gratifying than those relating to the former category *Up to the recent past, no progress in the diagnosis and treatment of con*genital heart disorders seemed possible The vast majority of little victims of such "mistakes of nature" did not survive to the age of puberty Large numbers of those showing signs of circulatory impairment at the time of or shortly after birth died within the first months of life An extensive descriptive literature, regarding types of anomalies served as a catalogue of medical curiosities but the outlook for treatment appeared bleak indeed

Then with the development of improved techniques for antemortem diagnosis and increased skill of vascular surgeons and anesthetists, surgical repair or reconstruction of many anomalies was finally achieved Angiocardiography and catheterization of the heart chambers and the great vessels entering or leaving them now supplement ordinary physical and x ray examinations in a most definitive way for diagnosis As joint

developments the newer methods of diagnosis and the surgical treatment have already saved the lives of thousands of children and have prolonged the useful lives of many others. These magnificent achievements are the fruits of painstaking research by numerous scientific workers.

SUMMARY

It need hardly be pointed out that the seventy-five-year period just passed witnessed far greater achievement in the field of pediatrics than did the entire past age of the human race. The amount of suffering prevented and the countless lives saved through the gifts of science during this period stand as immutable testimony to the value of rational thinking and painstaking experimentation on the part of all those who work for the health betterment of the human race.

HOWARD A RUSK

~ 12 ~

PHYSICAL MEDICINE AND REHABILITATION

By Howard A Rusk, M D

Professor and Chairman, Department of Physical Medicine and Rehabilitation, New York University College of Medicine, New York, New York

THE seventy-five years of progress in the other medical specialties reported by the other contributors to this volume, as in all progress, has given rise to new problems of chronic disability and has been indirectly responsible for the development of the specialty of physical medicine and rehabilitation Millions of persons throughout the world who would have died from accidents and diseases seventy five years ago now live because of the advances made in definitive medicine and surgery, many, however, have been left with chronic disabilities which affect their ability to cope with the daily activities of life and work

Progress in the saving of lives has also produced an aging population in this and the other developed areas of the world Seventy five years ago the average life expectancy in this nation was approximately forty two years, today it is sixty eight, and there is every reason to believe that it will become even higher in the future Seventy five years ago, 4 in every 100 Americans were sixty five years of age and older today the proportion is almost 8 in every 100 Chronic illness and its resulting physical disability strike at all ages, but the aged are their particular targets In one comprehensive survey, the rate of acute and chronic disabling illness among the age group sixty five and over was 729 per thousand as compared to 171 for persons of all other age groups

Lacking specific measures in the care of many of the chronic diseases, medicine must look to rebabilitation to teach those afflicted by disability to live and to work as effectively as possible Until the day that medicine finds the specific answers to the problems of the diseases of the heart and

circulation, rheumatic fever and arthritis, cerebral palsy, multiple sclerosis, poliomyelitis, and the other crippling diseases, we must utilize the techniques of physical rehabilitation, psychology, social service, vocational counselling and the auxiliary specialties to teach the disabled to live within the limits of their disabilities but to the full extent of their capacities

Until recent years, the great majority of the medical profession looked upon rehabilitation as an extracurricular activity of medicine, something dealing with social work and vocational training, but something which had little concern, or which held but few implications, for medicine Today, however, that trend is being reversed, and although there are still many physicians who are unfamiliar with the aims and procedures of rehabilitation, more and more, medicine is beginning to recognize that medical care cannot be considered complete until the patient with a residual physical disability has been trained "to live and work with what he has left'

Except in a few isolated instances, the physically handicapped person must be retrained to walk and travel, to care for his daily needs, to use normal methods of transportation, to use ordinary toilet facilities, to apply and remove his own prosthetic devices and to communicate either orally or in writing These are such simple things that they are frequently overlooked, but the personal, vocational and social success of the handicapped person is dependent upon them

The practice of rehabilitation for the general practitioner or for any doctor, begins with the belief in the basic philosophy that the doctor's responsibility does not end when the acute illness is ended or surgery completed, it ends only when the individual is retrained to live and work with what is left This basic concept of the doctor's responsibility can be achieved only if rehabilitation is considered an integral part of medical services Any program of rehabilitation is only as sound as the basic medical service of which it is a part The diagnosis and prognosis must be accurate, for it is upon them that the feasibility of retraining is determined

In addition to the general diagnostic studies, the medical evaluation of the orthopedically handicapped must include muscle tests, joint range of motion, and tests for the inherent needs in daily living In the Physical Medicine and Rehabilitation Services at the New York University-Bellevue Medical Center, a check list of 100 items is used to determine these factors They include (1) bed activities, such as moving from place to place in bed, and the ability to sit erect, (2) toilet activities, (3) eating and drinking, (4) the ability to dress and undress, such as tying shoe laces, manipulating buttons, zippers and other fasteners, and applying and removing braces, (5) hand activities, for example, winding a watch, striking a match, and using various door knobs and latches, (6) wheelchair activities, getting from the bed to the wheelchair, the wheelchair

to bed, and in and out of the bathtub, and, (7) elevation activities, which include the needed abilities for walking, climbing and travelling

At first glance, such a test list sounds formidable and time consuming, but, in reality, the information may be easily obtained by a therapist, nurse, a well trained volunteer or a member of the patient's family From special check sheets used for charting the activity accomplishments, information is readily available both on the status of the patient at the time of admission, and his progress while undergoing rehabilitation

The use of such a check list is particularly helpful if personnel are not available to do definitive muscle testing and accurate range of motion determination, for the daily activities test can be completed in the hospital, the physician's office or the patient's home The subsequent training program is designed to teach the patient the various skills and activities which he cannot perform

At the New York University Bellevue Medical Center, after the basic medical work up, and the range of motion muscle and needs of daily living tests, the physician, in conference with other staff members prescribes a five hour a day program for the patient These prescribed activities include training in the ambulation and elevation rooms and the remedial gymnasium, occupational therapy, physical therapy, speech therapy, or any other activity which may be helpful in meeting the specific needs of the patient

In a comprehensive rehabilitation program, vocational guidance specialists should also be available to do guidance and testing, in order that the patient may be started on a prevocational exploratory and work testing program as soon as it is medically feasible However, good basic rehabilitation can be carried out with the personnel available in the ordinary general hospital, if such a program is properly organized supervised and prescribed by the physician

REHABILITATION OF THE HEMIPLEGIC PATIENT

The course of patients with cerebral vascular accidents depends on the type of the lesion, the extent of the lesion and the presence or absence of other complicating factors The prognosis for life is grave if there has been a hemorrhage of any appreciable size or if a major vessel is the site of a thrombosis or embolus Cerebral vascular accidents with the exception of rupture of large basilar aneurysms rarely cause sudden death, and death within twelve hours is uncommon, the majority with a cerebral hemorrhage of any appreciable size usually die within two to fourteen days of the onset Many patients with a thrombosis or embolus of a cerebral vessel recover from their first attack Death in the fatal cases, does not usually occur for ten days to three weeks, when secondary complications, such as bronchopneumonia develop

About a third of the patients who enter the hospital with subarachnoid hemorrhage die during the first episode of bleeding A sixth of the patients die of a recurrent hemorrhage some time within a year after the first attack but usually between the second and fourth week after the initial episode The remaining half of the patients may be alive and well three to four years after the initial hemorrhage These may never have further disturbance of this nature or may die in a recurrence of hemorrhage as long as twenty seven years after the first attack

When a small vessel is the site of an embolus or a thrombosis, the patient is usually able to survive the insult unless the complicating factors (cardiac failure, uremia, coronary thrombosis or bacterial endocarditis) are serious enough to cause death With recovery from the initial shock, there is usually some improvement of the focal neurologic symptoms These may continue to improve for several months and may occasionally disappear entirely It is more usual, however, for the patient to be left with some permanent residual complaint, which may vary from stiffness and difficulty in the use of the leg in walking, awkwardness in the use of the hand, or some degree of speech defect to complete paralysis and total aphasia In an occasional case, there will be no improvement for a few weeks after the onset of symptoms but a gradual and appreciable improvement in the following months For this reason, improvement of the neurologic defect should not be considered optimum until at least six months have elapsed, and there is no time limit on the rehabilitation procedures although it is obvious that the earlier the better

Realistic rehabilitation must be based on a realistic approach and training program designed to teach the patient (1) the essential activities of daily living and (2) the avocational and vocational activities commensurate with the patient's skills, abilities, and disabilities

Evaluation of the Disabilities

If treatment is started early, there will be no limitation of motion at the joints and the affected arm and leg can be passively moved through their normal range If, however, the patient is not given early rehabilitation contractures usually result, especially at the shoulder

A flaccid hemiplegia only occurs in a small percentage of patients The usual spastic hemiplegic patient presents the following signs

The affected arm is internally rotated and abducted and the forearm, wrist and fingers are flexed When the patient is asked to move his affected arm, he will elevate the shoulder and abduct and internally rotate the arm When the patient's leg is fully extended, voluntary dorsal flexion of the foot is impossible When, however, the knee is flexed and the patient flexes his hip against resistance, the foot will dorsiflex and supinate (Strümpell's phenomena) Some individuals may have an angiospasm of the cerebral vessels and prevent a typical hemiplegic

syndrome There is usually a complete return of function in a few days If a patient has a normal return of function in the upper extremity, the lower extremity will usually be found to be normal In evaluating disability, if the muscle strength, range of motion, and activities of daily living are adequately evaluated and charted, it gives the physician and therapist an excellent method of objective evaluation as to the deficiency of the patient and also a means of evaluating progress

The purpose of a program of rehabilitation for the hemiplegic patient is (1) to prevent deformities, (2) to treat deformities if they occur, (3) to retrain the patient in ambulation and elevation activities, (4) to teach the patient to perform the activities of daily living and working with the unaffected arm and hand, (5) to retrain the affected arm and hand to its maximum capacity, and (6) to treat the facial paralysis and speech disability if they are present

1 Prevention of Deformities

The spastic hemiplegic patient, when lying in bed, holds the upper extremity in abduction and internal rotation with the elbow, wrist and fingers of the affected part in a flexed position The affected lower extremity is usually flexed and abducted at the hip joint, the knee is flexed and the ankle is plantar flexed and supinated

If treatment is started within a few days following the cerebral accident, there is no need for any special procedures to protect the affected limbs If, however, due to hemorrhage or other complications, the patient must remain in bed for a period of time, then procedures must be instituted to prevent deformities

Procedures —A posterior ankle splint is needed to prevent shortening of the heel cord A pillow in the axilla will prevent abduction and internal rotation of the shoulder joint which is a frequent residual deformity in hemiplegia Passive movements of the arm in abduction external rotation and in the overhead position should be performed several times a day to prevent a "frozen shoulder"

2 Treatment of Deformities

The principal deformities which occur are a frozen shoulder and short heel cord

Procedures —The use of heat and massage to the arm and shoulder are of value in preparing the part for stretching Passive movements of the shoulder are useful in increasing the range of motion These movements can be performed by a therapist nurse, or by the patient

A short heel cord can usually be lengthened with procedures The heel cord can usually be lengthened with stretching and a short leg brace with a 90 to 110 degree stop at the ankle to hold the gains made by stretching and ambulation

3 Ambulation

Flexion and extension movements at the hip and knee can usually be performed by the spastic hemiplegic patient who is started on early ambulation When however, the hip and knee are flexed as in walking, the foot dorsiflexes and supinates The patient is usually afraid to place the supinated foot on the floor because of the danger of injuring the ankle or falling To prevent this foot movement, he walks with the knee joint stiff and circumducts the lower extremity This is a slow awkward gait, and if used for a period of time, the patient will develop a pattern of walking which will be difficult to correct

A double bar short leg brace with a stirrup attachment 90 degree ankle stop and a supinator 'T' strap should be prescribed to prevent plantar flexion and supination of the foot and give the patient confidence so that he will flex his knee and hip With the brace and a cane in the affected hand for balance most hemiplegic patients soon learn to walk without assistance

A patient with a flaccid hemiplegia from a cerebral accident will be unable to make a voluntary movement when in the supine position If, however the patient is held in the erect position with the affected lower extremity on the floor, he will flex and extend the leg as in walking and be able to bear his body weight The sensory contact of the foot on the floor stimulates the reflex pattern of walking Ambulation should be the first procedure in the rehabilitation program as it can be accomplished by the majority of patients

Many patients especially those in the younger age groups learn to walk with a good reciprocal pattern without the aid of a cane No patient however, seems to learn the reciprocal arm pattern without special training

The normal pattern of walking is to move the right arm and left leg forward and then the left arm and right leg The hemiplegic patient walks with the affected arm motionless abducted and partially flexed at the elbow It is necessary to break this pattern of walking if the patient is to have the appearance of being normal

4 The Upper Extremities

As a return of function in the affected upper extremity cannot usually be expected for a long period of time, if it ever does return, it is essential to teach the patient to care for his daily needs with his unaffected arm

A right hemiplegia in a right handed person is a serious disability because of the sensory and motor aphasia and the lack of skill in the left hand to perform the activities essential for daily living The training of the left hand should be started early, and the patient must become left-handed if he ever hopes to care for his daily needs Simple tasks in eating

and dressing should be started. Left-handed writing must be practiced, as this is an important means of communication, especially when speech is affected.

Training of the affected arm is started while the patient is developing one-handed skills with the unaffected arm. If the arm is flaccid, a re-education program similar to that used in poliomyelitis, should be started. Many of these patients have a complete return of function if the muscle re-education is given carefully over a period of time. The rehabilitation of the spastic arm should start at the shoulder. The most difficult shoulder movement for the patient to regain is external rotation. Flexion and extension of the forearm is difficult for the spastic hemiplegic to perform. When asked to flex the elbow, he elevates the shoulder and abducts and internally rotates the arm. Pronation and supination of the hand are usually impossible, as these are the last movements learned by man and the last to return. Internal and external rotation of the arm are primitive movements, and the patient attempts to substitute these movements for pronation and supination. The fingers and thumb are usually flexed tightly. If the fingers and thumb are forced open, they can be flexed, but active extension movements are usually impossible. On yawning, the fingers of the hand usually extend.

The exercise program for retraining the affected arm depends upon the patient. Results cannot be expected by having a therapist work on the patient. Working with the patient so that he understands what exercises are to be practiced many times a day is the only procedure which will improve the disabled arm.

The wrist, if not flexed, needs no special training. There are very few activities we cannot perform even with a fused wrist. We have increased the functional use of the hand in several young patients with extreme flexion of the wrist by fusing the wrist joint. A cock-up splint should be used if there is extreme flexion of the wrist, and this should be combined with a "pancake" splint if the fingers are tightly flexed.

The fingers of the spastic hemiplegic patient are practically impossible to re-educate for any useful purpose. If adequate function is attained, it will take years of effort by the patient. In the aged, with cardiovascular disease, it is not often worth the effort. We should not, however, have the patient give up hope of ever using the fingers. He must be made to understand the movements of the fingers depend upon the proper functioning of the shoulder, elbow and hand and placing the hand in positions for purposeful movements.

One of the most difficult problems in the management of the hemiplegic is the problem of aphasia. It is extremely important that the physician explain the meaning of aphasia to both the patient and his family as soon as the patient has recovered consciousness and aphasia is noted. Failing to understand this, many patients and their families will otherwise fear the patient is "losing his mind." The patient and his family should

be impressed with the necessity for retraining measures and should be told factually and honestly that there is no medical therapy for this condition

We are only beginning to understand some of the basic problems which are involved in the rehabilitation of the aphasic patient We do know that aphasia symptoms need retraining and that spontaneous recovery is only a small part of the success that can be achieved through retraining Therapy must be at all times practical, with an eye toward the individual's needs in his daily life—a functional rather than an academic philosophy of aphasia therapy is needed

REHABILITATION OF THE AMPUTEE

Although the general practitioner is forced to call upon the services of medical specialists when dealing with amputee patients, he must assume the responsibility for preparing his patient physically and psychologically for the amputation, and to see that the patient has the proper prosthetic device adequately fitted and is trained in its use

One phase of the management of the amputee to which the physician should give particular attention is the immediate postoperative period while the stump is being shrunk in preparation for a prosthetic device During this period of six to eight weeks, the patient should be given graduated conditioning exercises in preparation for both crutch walking and the later use of the artificial limb, and measures should be taken to prevent anatomical deformities

For example, it is not an uncommon practice in many hospitals, following an above knee amputation, to elevate the stump upon a pillow However if such elevation is maintained for as long as two weeks, a flexion deformity will occur which will take from six to eight weeks of *arduous painful work before sufficient hyperextension can be regained for* satisfactory walking

In advising his patient on the selection of a prosthetic device, the physician must be aware that not all limbs are suitable for all amputees In fact he must realize that not all amputees can wear artificial limbs profitably It has been noted that an above knee amputee in the older age group cannot, as a rule, profitably be trained to use a prosthesis if he is unable to perform a swing through gait on crutches

The physician must point out objectively to the patient those skills which the patient can expect to achieve with proper training, and those skills which the patient has little chance of ever regaining Extreme caution must be taken in the latter, however, as it is unwise to tell a patient what "he can't do," for this cannot be determined, in most cases, until the patient has had adequate training Training is absolutely essential if the amputee is to be successfully rehabilitated

REHABILITATION IN MULTIPLE SCLEROSIS

Because of the hopeless outlook in multiple sclerosis, therapy in general has been directed toward symptomatic relief, and the approach has been a negative one In rehabilitation, the disability, rather than the specific disease process which has produced it, is our primary consideration In multiple sclerosis, the problems are the same as in any other chronic, progressive, crippling disease In considering the feasibility of successful training of a patient, progression of the disease must be carefully evaluated, if the disease process outstrips training, such training is obviously wasted

The primary consideration in working out a program for rehabilitating the severely disabled is to teach him to live and, if possible, to work, with what he has left Those capacities can be determined only through performance testing It is impossible, through the analysis of the clinical manifestations of a disease such as multiple sclerosis, to determine what the sum total of the remaining physical capacities of the patient can be trained to do in the way of work or self care activities In addition to general diagnostic studies, the medical evaluation of the patient with multiple sclerosis must include muscle tests, joint range of motion tests and tests for the inherent needs of daily living These are of primary importance, for it is on their results that the patient's rehabilitation program is planned

Too frequently in rehabilitation, many of the basic skills necessary for effective daily living are overlooked The patient is given numerous medical, psychologic, and vocational services in preparation for employment, but retraining in the basic physical skills of ambulation elevation, and self care activities is neglected, with the result that the patient being unable to walk, travel or care for his personal needs is also unable effectively to utilize the other medical, psychologic, social and vocational services which he has received for richer and fuller living

Retraining in the basic physical skills of daily living is primary it is simply a matter of "first things first," for daily activity skills are the basis for all subsequent rehabilitation processes

It has been found difficult in many instances to differentiate between muscular inability due to disease and that due to atrophy of disuse and sometimes only a test period of conditioning exercise will provide this information which is vital in the training program

From the information gained by the tests for the factors of daily living a suitable program is set up for the patient designed to meet his particular needs It has been noted especially in hand activities and gait training that persons long incapacitated from multiple sclerosis will have alienation and overcompensation of certain muscle groups With muscle re-education and definitive therapeutic exercise much may often be accomplished in correcting these conditions

REHABILITATION OF THE PARAPLEGIC PATIENT

Although the rehabilitation of these patients is a mission requiring the teamwork of the orthopedist, the neurosurgeon, the urologist, the neurologist, and in many instances the plastic surgeon, it is a rehabilitation problem in which the general practitioner plays an important role His services are invaluable in maintaining the morale, nutrition, and general health of the patient, and on his shoulders frequently falls the task of correlating the work of the specialists and interpreting it to the patient In many instances, he must also make the decision as to whether rehabilitation should be attempted This decision is one that should be approached with hope courage and understanding, rather than the defeatist attitude that so frequently exists

On completion of definitive medical and surgical therapy, rehabilitation is accelerated and the patient is placed on a full program A usual prescription for a paraplegic would run as follows General conditioning exercises are performed for one hour on a mat on the floor in conjunction with a group of other paraplegic patients and include strengthening exercises for the muscle groups of the upper extremities and such abdominal and trunk muscle groups as are present The patient is taught balance while sitting and holding his spine in an erect position Particular attention is paid to development of the latissimus dorsi muscle Short sawed off crutches may be used to practice push ups on the mat while sitting

General exercises are followed by an hour's workout in the ambulation room The patient is fitted with braces by placing his feet in position and then releasing his grasp on the parallel bars Later he will be taught to do a swing to gait and eventually a swing through on the parallel bars As he becomes more proficient and his sense of balance improves, he is started on crutches within the parallel bars, after which he is allowed to ambulate outside the parallel bars with an attendant and finally to ambulate alone Before patients leave the Institute, they are instructed in the necessity for standing in braces and crutches at least one hour a day the purpose of which is to enhance the calcium metabolism in the long bones and to prevent the formation of kidney and bladder stones Because standing and exercise are so important to the patient's health, even if he does not eventually ambulate to any great extent, he is urged to spend at least one hour a day in a standing position for the rest of his life

A two hour period per day is spent in "ADL" (Activities of Daily Living) which has been described earlier in this chapter This is perhaps one of the most important parts of the rehabilitation program for the patient is taught to take care of his own daily needs such as cleansing and dressing himself

The fifth hour of a typical rehabilitation program for a paraplegic patient will be spent in vocational testing and guidance and social welfare problems, including psychological help if it is needed

The management of the bladder is most important Tidal drainage is the simplest method of early management However, this may not be feasible, and a certain percentage of cases will require duprapubic cystotomy

One of the greatest problems in the management of paraplegia is the prevention of decubitus ulcers Frequent turning and good nursing are most valuable, but it is all important to maintain a high protein intake from the onset of the condition If this is not possible by the usual dietary supplements amino acid, blood transfusion, and all of the other means available should be exercised

It is now a well established fact that nutrition plays a primary role both in the development and the healing of decubiti In certain types of patients, these will develop within twenty four hours after the injury if strenuous methods are not followed to prevent them

It is our conviction at the Institute of Physical Medicine and Rehabilitation that early laminectomy is the treatment of choice in patients who are paralyzed from injuries of the thoracic and lumbar spinal cord The low morbidity and mortality rates that now attend this operation, the uncertainty as to whether an anatomic transection of the spinal cord exists, the decreased incidence of pain and spasticity among patients who have had a satisfactory laminectomy, the psychological benefit to the patient, and the neurological recovery evidenced by some patients following operation seem to us adequate indications for the performance of laminectomy prior to the institution of a long range rehabilitation regimen

It is necessary that a rehabilitation program be started on the paraplegic patient as soon as possible This must include not only strengthening exercises for those muscles that are left but also training of the patient around his disability in order that he may become self sufficient in the activities of daily living, standing and ambulation Such a program will tend to decrease the incidence of decubitus ulcers urinary infection and calculi, malnutrition, and psychological depression

REHABILITATION OF THE QUADRIPLEGIC PATIENT

Quadriplegia, in the past, has been considered one of the most difficult and hopeless problems in medicine Today, this is not true

In the rehabilitation of the quadriplegic patient it is of prime importance that he be seen early in order that spasticity and other contributing causes to contractures may be controlled The status of bowel, bladder, decubitus ulceration and general paresis of the trunk and

abdomen must be appraised in terms of their severity and amenability to correction before rehabilitation is considered

The management of the quadriplegic patient is twofold, it lies in the measures directed toward preparing the patient for rehabilitation, and in the rehabilitation training program

The measures are

1 *Prevention of Deformities or Contractures* —(*a*) By the judicious use of splints (plaster of Paris plastic, footboards and sandbags), and (*b*) by a planned procedure for passive motion by a therapist or nurse to *all* movable joints

2 *Exercises* —At the earliest permissible time active and passive exercises should be begun to prevent atrophy of disuse, to maintain or improve muscle strength, and to prevent the deconditioning phenomenon of bed rest Particular efforts should be extended toward maintaining strength in the arm and hand muscles Reverse push ups (pushing sand bags or dumbbells) are of particular benefit Breathing exercises to maintain normal aeration, to correct reverse breathing and to establish new breathing patterns are likewise necessary

3 *Care of the Skin* —The management of decubitus ulcers may be considered as twofold prophylactic and therapeutic The usual prophylactic measures are frequent turning and keeping the bedclothes and patient dry The necessity for maintenance of general nutrition and the necessity for protein supplementation directed toward maintaining normal blood protein levels as well as vitamin supplementation are obvious The full thickness skin graft for the closure of large decubitus ulcers has been the most effective measure in this group

4 *Bowel and Bladder Training* —Measures should be undertaken for regulation of sphincter impairment as soon as feasible Evaluation of the bladder status should be made as indicated A catheter should never be left in the urethra for more than five days without being changed as calculi formation around the catheter tip often occurs Routine urinalysis should be performed in order to insure the early treatment of urinary infections As soon as possible the patient should be placed on a rigid twenty four hour training schedule starting with one half hour intervals for voiding and the intervals should be increased to individual tolerance The management of the bowels usually resolves itself to one of constipation which can be controlled through the use of bulk forming foods and enemas or glycerin suppositories as necessary

5 *Prevention of Cardiovascular and Respiratory Deconditioning* —All patients are likely to exhibit a blackout, syncope like phenomenon when the first attempts to sit up are made Since the work of Dietrick and his associates demonstrated the hyperreaction of the tilt top table after prolonged bed rest it seems obvious that semirecumbent posture for at least part of the day is indicated After prolonged bed rest, the patient should

be kept in the sitting position for only a few seconds the first day, and thereafter the intervals should be gradually increased to full tolerance

On the basis of the total evaluation data, the patient is placed on a five hour training program Physical therapy, in the form of heat, is usually used prior to any exercise session, particularly if any pain or spasticity is present Hydrogymnastics electric stimulation of muscles, and ultraviolet radiation are all valuable Occupational therapy is prescribed for both its psychologic and specific physiologic and functional values Such activities as would require hand and arm motions are obviously beneficial to these patients

Special training routines are instituted to teach the patient how to roll from side to side in bed and how to sit up in bed Mat exercises, push ups on the mat, wall pulleys, and similar exercises are added at opportune times in an effort to improve the strength of the upper part of the body Periodic muscle tests are done to evaluate the degree of return of muscle power

Accurate prognosis in quadriplegic patients can be made only after a preliminary period of six weeks of rehabilitation training After this period and a re evaluation of the status of the patient, noting return of motor power, the psychologic attitude toward his disability and the social and vocational problem, a long range program may be outlined It has been found that the full utilization of the patient's waking hours in any form of activity, using occupational therapy and recreational therapy, makes for a more cooperative patient Activity alleviates anxiety The success or failure of any rehabilitation program rests with the patient's attitude toward his disability, and this cannot be overemphasized in the case of quadriplegic patients Time spent with the patient and the family in discussing the problem with which they are faced is invaluable for future orientation and planning

SUMMARY

The specific disabilities described above are of course not the only conditions in which the dynamic therapeutics of rehabilitation are indicated With an all out program of total rehabilitation therapy results can also be achieved in the rehabilitation of patients with the chronic arthritides pulmonary disease the chronic degenerative neurological diseases and those patients who have hypertensive arteriosclerotic and rheumatic myocardial, and vascular lesions with a cardiac reserve so diminished that they show signs and symptoms of decompensation after activity In all instances the problem is to use every thing which medicine has at its command to meet the individual needs of the patient and restore him to his maximum functional capacity

Regardless of the type of disability, the responsibility of the physician to his patient cannot end when the acute injury has been cared for It

ends only when the physician has taken the responsibility for seeing that proper referral has been made to those agencies and institutions which are equipped to rehabilitate and retrain the patient with a residual physical disability. The physician who fails to see that those patients under his care receive the full benefits of modern methods of medical rehabilitation and retraining, is in the same category as the physician who still persists in using dietary restriction alone, for medical care is not complete until the patient has been trained to live and work with what he has left.

WILLIAM G HAMM

FRANK I KANTHAK

13

PLASTIC SURGERY

By William G Hamm, M D , F A C S
Clinical Assistant Professor of Surgery (Plastic), Emory University School of Medicine, Emory University, Georgia

and

Frank F Kanthak, M D , F A C S
Instructor in Surgery (Plastic), Emory University School of Medicine, Emory University, Georgia

THE development of plastic surgery has coincided with that of other surgical specialties and followed more rapidly after the discovery of anesthesia and the use of aseptic technique However, certain aspects of what are now considered to be fundamental parts of plastic surgical technique have long been advocated and utilized by those interested in this type of surgery Thus the use of atraumatic instruments such as hooks for holding tissue and the placing of many fine sutures has long been advised and used

The field of plastic surgery has gradually become more fully delineated At one time, and somewhat even at the present, the term "plastic surgery connoted "cosmetic surgery ' While a certain portion of the plastic surgeon's field is cosmetic, a greater part possibly is reconstructive, repairing the defects of congenital or acquired deformities The term "plastic surgery" was first used by Eduard Zeis as the title of his book "Handbuch der Plastischen Chirurgie, which was published in 1838

What is meant by plastic surgery? Davis answers in the following "Its science is the organized knowledge of the fundamental principles involved in the transplantation and shifting of tissues Its art is the application of this knowledge and the actual manipulative reconstruction Its field extends from the top of the head to the soles of the feet "

Plastic surgery is primarily that branch of general surgery which is distinctly formative or constructive It deals with the repair of defects and malformations either congenital or acquired, with the restoration of function and comfort, and incidentally with improvement of appearance This is accomplished chiefly by adjustment of tissues or by the transfer

of all types of transplantable tissues, either from the immediate neighborhood or from some distant location

The deformities dealt with in plastic surgery, for the most part, involve the skin or adjacent soft tissues of the entire body but frequently the framework of bone or cartilage underlying the soft parts must also be reconstructed or adjusted The treatment of large, denuded surfaces and of intractable wounds of all types which require skin grafting or flap shifting or placing also belong in the field of plastic surgery

There is another aspect of the subject which may be called cosmetic plastic surgery, and this deals with the correction of imperfections in human proportions and has as its primary object the restoration of symmetry of contour and improvement of appearance There are well trained and ethical surgeons who specialize in this aspect of plastic surgery, but it must be understood that this is also the field in which the charlatan and the quack devote their energies Realizing the eagerness of the public to resort to surgery for the correction of facial deformities, irresponsible and poorly trained members of the profession exploit the situation For a while, plastic surgery struggled at the abyss of disrepute caused by the commercializing charlatans In order to dissociate themselves from this mercenary group ethical representatives gave different names to the specialty, such as reconstructive surgery, reparative surgery, maxillo facial surgery, etc This situation has largely been corrected now, since there are many trained and qualified plastic surgeons to carry on both the reconstructive and the cosmetic aspects of plastic surgery but it took a considerable period of time before these undesirable members of the profession were weeded out and eliminated as a source of trouble to both the patient and the ethically practicing plastic surgeon Strange as it may seem, even at the present time, when plastic surgery is spoken of, many of the medical profession immediately think of the cosmetic aspect only, and entirely forget the major reconstruction work by which plastic surgeons can restore injured, deformed parts to usefulness and thus enable the handicapped person to occupy an earning place in society While one misconception is that plastic surgery is confined to facial surgery another one includes skin grafting in addition to facial surgery while this is an important part of the armamentarium of the plastic surgeon, it is by no means the only one

The entire field of plastic surgery, as we know it today, was developed in America by men such as Vilray P Blair of St Louis, Ferris Smith of Grand Rapids, Varaztad H Kazanjian of Boston, John Staige Davis of Baltimore Gordon New of Rochester, Minnesota and Robert Ivy of Philadelphia In Europe the work was fostered by Harold Gillies of England, Erich Lexer of Germany and Hippolyte Morestin of France This is not a complete list of the men who fostered and perpetuated the science and art of plastic surgery, but they are its principal founders

Not until World War I did the important role of plastic surgery become generally recognized In June 1917 the United States Army organized the section on head surgery or maxillo facial surgery with Dr Vilray Blair as Chief of Plastic Surgery In this country, three hospitals were especially designated for plastic surgery cases, namely, Jefferson Barracks in Missouri under Dr Blair, Walter Reed under Dr Robert Ivy, and Fort McHenry under the late Dr George Schaeffer Even after World War I, however, the place of plastic surgery as a surgical specialty was not well defined and its place on hospital services was questioned This is partially explained by the fact that the specialty itself was not fully clarified and its boundaries and those of the related fields were still largely undefined There is considerable overlap between that of plastic surgery and other surgical specialties Only a few surgeons in the country could afford to devote their full interest to this newly developing and precarious specialty Gradually in the latter part of the 1920 s due to the increasing recognition and appreciation of the importance of the surgical correction of deformities and the treatment of wounds, more and more hospitals established plastic surgery services While at one time it was very difficult for young men to receive training in this field in an accredited hospital as a branch of the surgical service, unless it were in the form of a preceptorship, it has now developed so that a number of residencies are offered in modern hospitals to train adequately people interested in this phase of surgery

The first national organization including representative plastic surgeons was organized in 1921 as the American Association of Oral Surgeons In 1927, the name was changed to the American Association of Oral and Plastic Surgeons and, in 1942, it became the American Association of Plastic Surgeons which, while it has a limited membership comprises approximately 85 members at the present time Another society was organized under the name of the Society of Plastic and Reconstructive Surgery in 1931 and the name of this society was changed in 1941 to the American Society of Plastic and Reconstructive Surgery One of the most significant steps toward recognition of the specialty was made when the American Board of Plastic Surgery was formed in June 1937 It was a tentative organization until May 1938 when it was reorganized as a subsidiary of the American Board of Surgery The final step in the development of plastic surgery as a specialty was in May 1941 when the Advisory Board for Medical Specialties of the American Medical Association gave the Board of Plastic Surgery the status of a major board This was achieved as an autonomous board and was thereby removed as a subsidiary of the American Board of Surgery This result was due largely to the efforts of Dr Vilray P Blair

One of the Board's great achievements is the standardization of the training of plastic surgeons on a level with the other surgical specialties

It demands as a basic requirement two years of graduate study in general surgery before special training for another two years in plastic surgery Following this, two years of practice in plastic surgery are necessary be fore the man is qualified to stand for an examination of the Board There are at the present time a total of 233 diplomates of the American Board of Plastic Surgery in widely scattered cities of the United States and Canada

In order to disseminate more easily the growing literature on plastic surgery a monthly journal, the "Journal of Plastic and Reconstructive Surgery," was started in 1947 A quarterly journal, the "British Journal of Plastic Surgery," was started shortly afterward These two journals have contributed greatly to making the field available for men interested in the progress of plastic surgery and in making techniques developed by other plastic surgeons more widely utilized for the benefit of their patients

In 1919, J Staige Davis published a book which covered the compre hensive field of plastic surgery It was an important milestone in medical literature of that field Earlier Vilray Blair had published a book on surgical diseases of the mouth and jaws which was later changed and condensed to the essentials of oral surgery Both these books had an influence in developing the field and in bringing to the attention of other medical practitioners the work that plastic surgeons were doing and were capable of doing Since that time a number of books have been published, the most outstanding of which are "Plastic Surgery of the Face" by Harold Gillies in 1920, "Plastic and Reparative Surgery" by Hans May in 1947, "Plastic and Reconstructive Surgery" by Earl Padgett and Katherine Stephenson in 1948, and "Plastic Surgery" by Ferris Smith in 1950

The procedures of the plastic surgeon consist of the transplantation of tissues which may be of skin, bone, cartilage, fat or fascia, with a refine ment of technique commonly used, as atraumatic as is possible, the gentle handling of tissues, the absolute control of hemostasis the use of fine ligatures and multiple small sutures Many of the details of plastic surgery were recommended by general surgeons, notably William Stewart Halsted who was very much interested in plastic surgery In Hal sted s collected papers, one finds numerous cases that would now belong in the plastic surgeon's field Some of the procedures Halsted used have now been discarded as impractical or impossible For example, he recites the case of a boy whose cheek was to be reconstructed and a large area of mucosa was to be restored For this purpose, Halsted removed a large portion of a dog's mucosa which he transplanted into the cheek of the boy The operation was apparently successful but, as is the case of all homotransplants, the graft finally failed and thus the operation was not successful

Skin Grafting

It might be of interest at this time to review the development of skin grafting which is one of the most useful procedures the plastic surgeon can use In 1869, J L Reverdin reported a method for hastening the healing of granulating wounds by means of small, very thin pieces of transplanted skin which he called epidermic grafts In 1872, L X Ollier reported the successful transplantation of larger films of skin up to 8 square centimeters, using the entire epidermis and a portion of the dermis In 1886, Carl Thiersch presented his perfected method of skin grafting in which he covered the defects with large films of epidermis with a very small portion of the dermis This operation was somewhat similar to the method used twelve years previously by Ollier to whom he gave no credit Vilray Blair further developed this method of covering intractable wounds by utilizing what he called the "split thickness skin graft" which contained varying portions of the dermis in addition to the epidermis These grafts were cut in large sheets and sewn or laid on a granulating wound with a great deal of success Still later Earl Padgett developed a method of cutting the skin graft which did not involve use of the free hand razor or knife An instrument was devised called the dermatome which allowed one to cut grafts 4 by 8 inches in area including a predetermined amount of dermis This instrument was a great stimulus to the use of skin grafting by plastic surgeons as well as general surgeons, throughout the world Various modifications of this instrument have appeared which have facilitated the cutting and placing of grafts

In 1875, John Wolfe reported the successful repair of a defect about the lower eyelid with a free whole thickness graft from the arm These full thickness skin grafts were used with greater frequency by Fedor Krause and to him is due the credit for bringing the full thickness graft into practical use In searching for a simpler technique for skin grafting which could be used without difficulty by almost anyone, J Staige Davis described in 1941 what he called the small, deep graft which was based on Reverdin's idea but instead of being the thinnest bit of superficial skin that could be cut, it included the full thickness of skin at its center This type of graft has turned out to be of general value However, it has the great disadvantage of marring the donor area and also of producing a poor cosmetic effect on the recipient site These grafts are also frequently referred to as "pinch grafts" Many modifications of these methods of skin grafting have been devised and adopted For example in 1917 J I Esser utilized a skin graft on a mold made of dental modeling compound which he embedded in the mouth for the relief of a scar which bound the lower lip to the mandible The mold was introduced through an incision beneath the chin to avoid contamination This procedure was successful and later Carl Waldron grafted directly in the mouth using the same method It was found that bacteria inside the mouth did not necessarily destroy the graft or prevent its growth

At the present time one of the most frequently utilized methods of skin grafting is called 'stent' grafting where the graft is fixed to the donor area by means of a modeling compound mold or a gauze mold which is firmly tied in position by sutures which are tied over the holding device Free grafts of skin are usually construed to be skin without any subcutaneous tissue because it has been found by experience that if any subcutaneous tissue is allowed to remain on the graft, it will not grow The reasons for this are obvious since a skin graft survives primarily by diffusion of tissue juice during the first forty-eight to seventy two hours, and the thicker the graft and the more subcutaneous tissue that is allowed to remain on it, the less diffusion can occur to insure the viability of the cells which are struggling for survival One exception to this is the use of the composite ear graft which consists of either a portion of the lobe or helix of the ear, comprising skin, cartilage and skin, in other words, a graft composed of many elements which is transferred as a free graft, usually to the ala of the nose and occasionally to the eyelid to replace losses there This method was first described by F Koenig in 1914 and was later popularized by J Barrett Brown during World War II when he demonstrated the unusual number of successes that could be attained by this procedure, utilizing antibiotics and proper aseptic precautions In general however, where skin and subcutaneous tissue has to be transplanted this method of transplantation is known as a "flap" The method of dealing with flaps consists of allowing the flap to be attached to one point to receive nourishment while it is grown to the part needing repair Flaps have been used from the earliest times for reconstruction of defects of the nose but their modern usage has been considerably developed and refined One of the most interesting refinements was first publicized by Harold Gillies who tubed the flap This consists in suturing the raw edges of the flap around to create a structure like a suitcase handle from which one end can then be transplanted to the desired part without the danger of infection ensuing from the resulting raw area This method was first described by Filatov in 1917, but it is apparent that Gillies worked out the method independently even though he described it in 1918 In connection with flaps it may be stated that the flap of skin and subcutaneous tissue may be taken from an adjacent site if this is available or from some distant site However, when a flap or skin graft is transplanted to the face, one always should be cognizant of the differences in texture and color of the skin from various parts of the body There is no change in the structures to compare with the part in which they are transplanted In other words there is autonomy of tissue which persists in spite of any treatment which can be given There is no metaplasia of scar or fibrous tissue into cutaneous tissue and therefore it is necessary to use skin for these surfacing problems Skin transplanted into the mouth does not take on the characteristics of mucous membrane but always remains as skin and may even grow hair, if it is cut deeply

enough to include the hair follicles Skin from a distant part of the body retains the characteristics of the part from which it came, not those of where it is placed These factors make the role of cosmetic plastic surgery a difficult one indeed, and while improvement can be anticipated, the result achieved is not always the one desired by either the patient or the doctor attending

Other Types of Grafts

Transplantation of skin and subcutaneous tissue of necessity, must come from the individual to whom it is to be transplanted This differs with the transplantation of cartilage and cornea each of which may be transplanted from one individual to another These transplants do not survive, apparently, in the form of living grafts, but die and are retained as biologically tolerated foreign bodies The same is not true for skin Though occasional reports of success in homotransplantation have been made, in the vast majority of cases homotransplantation fails after four to eight weeks These factors have brought up an interesting problem in plastic surgery which has been present for many years It is obvious that if tissues could be successfully transplanted from one individual to another, a great improvement could be made in both the function and cosmetics of the procedures involved and in the time consumed producing these effects However, the problem of transplanting skin and subcutaneous tissue from one individual to another is the same that it was approximately seventy five years ago This procedure is not successful and the reasons for its lack of success are essentially a lack of compatibility between tissues of different individuals The only known exception to this is that of identical twins, when skin can be successfully transplanted from one to the other Therefore, it is true that each individual s tissues are biologically and genetically different from every other individual's tissues This problem is not yet solved and while that does not mean it cannot be solved, at the present time there are no good leads for the successful transplantation of skin and subcutaneous tissues from one person to another The only tissues that can be transplanted successfully as was mentioned before, are those that do not require a blood supply and which die and are later replaced more or less in their entirety Bone falls in this category A bone graft taken from a bone bank is probably replaced in its entirety by growing tissue from each end and therefore acts as an osteogenic conductor to stimulate the formation of new bone across a gap Cartilage taken from another individual and transplanted to the patient is frequently tolerated, and will remain as a foreign body though in some cases there is evidence of continuous destruction of the cartilage in place A cornea transplanted from one individual to another also presents the same problem In neither of these last two tissues is there a blood supply involved Neither cartilage nor cornea have a blood supply

At the present time one of the most frequently utilized methods of skin grafting is called "stent' grafting, where the graft is fixed to the donor area by means of a modeling compound mold or a gauze mold which is firmly tied in position by sutures which are tied over the holding device Free grafts of skin are usually construed to be skin without any sub cutaneous tissue because it has been found by experience that if any subcutaneous tissue is allowed to remain on the graft, it will not grow The reasons for this are obvious, since a skin graft survives primarily by diffusion of tissue juice during the first forty eight to seventy two hours, and the thicker the graft and the more subcutaneous tissue that is al lowed to remain on it the less diffusion can occur to insure the viability of the cells which are struggling for survival One exception to this is the use of the composite ear graft which consists of either a portion of the lobe or helix of the ear, comprising skin, cartilage and skin, in other words, a graft composed of many elements which is transferred as a free graft, usually to the ala of the nose and occasionally to the eyelid to re place losses there This method was first described by F Koenig in 1914 and was later popularized by J Barrett Brown during World War II when he demonstrated the unusual number of successes that could be attained by this procedure, utilizing antibiotics and proper aseptic precautions In general, however, where skin and subcutaneous tissue has to be trans planted this method of transplantation is known as a "flap" The method of dealing with flaps consists of allowing the flap to be attached to one point to receive nourishment while it is grown to the part needing repair Flaps have been used from the earliest times for reconstruction of defects of the nose, but their modern usage has been considerably de-veloped and refined One of the most interesting refinements was first publicized by Harold Gillies who tubed the flap This consists in suturing the raw edges of the flap around to create a structure like a suitcase handle from which one end can then be transplanted to the desired part without the danger of infection ensuing from the resulting raw area This method was first described by Filatov in 1917, but it is apparent that Gillies worked out the method independently even though he described it in 1918 In connection with flaps it may be stated that the flap of skin and subcutaneous tissue may be taken from an adjacent site if this is available or from some distant site However, when a flap or skin graft is transplanted to the face, one always should be cognizant of the differences in texture and color of the skin from various parts of the body There is no change in the structures to compare with the part in which they are transplanted In other words, there is autonomy of tissue which persists in spite of any treatment which can be given There is no meta plasia of scar or fibrous tissue into cutaneous tissue and therefore it is necessary to use skin for these surfacing problems Skin transplanted into the mouth does not take on the characteristics of mucous membrane but always remains as skin and may even grow hair, if it is cut deeply

enough to include the hair follicles Skin from a distant part of the body retains the characteristics of the part from which it came, not those of where it is placed These factors make the role of cosmetic plastic surgery a difficult one indeed, and while improvement can be anticipated, the result achieved is not always the one desired by either the patient or the doctor attending

Other Types of Grafts

Transplantation of skin and subcutaneous tissue, of necessity, must come from the individual to whom it is to be transplanted This differs with the transplantation of cartilage and cornea, each of which may be transplanted from one individual to another These transplants do not survive, apparently, in the form of living grafts but die and are retained as biologically tolerated foreign bodies The same is not true for skin Though occasional reports of success in homotransplantation have been made, in the vast majority of cases homotransplantation fails after four to eight weeks These factors have brought up an interesting problem in plastic surgery which has been present for many years It is obvious that if tissues could be successfully transplanted from one individual to another, a great improvement could be made in both the function and cosmetics of the procedures involved and in the time consumed producing these effects However, the problem of transplanting skin and subcutaneous tissue from one individual to another is the same that it was approximately seventy five years ago This procedure is not successful and the reasons for its lack of success are essentially a lack of compatibility between tissues of different individuals The only known exception to this is that of identical twins, when skin can be successfully transplanted from one to the other Therefore, it is true that each individual's tissues are biologically and genetically different from every other individual's tissues This problem is not yet solved and while that does not mean it cannot be solved, at the present time there are no good leads for the successful transplantation of skin and subcutaneous tissues from one person to another The only tissues that can be transplanted successfully as was mentioned before, are those that do not require a blood supply and which die and are later replaced more or less in their entirety Bone falls in this category A bone graft taken from a bone bank is probably replaced in its entirety by growing tissue from each end and therefore acts as an osteogenic conductor to stimulate the formation of new bone across a gap Cartilage taken from another individual and transplanted to the patient is frequently tolerated and will remain as a foreign body though in some cases there is evidence of continuous destruction of the cartilage in place A cornea transplanted from one individual to another also presents the same problem In neither of these last two tissues is there a blood supply involved Neither cartilage nor cornea have a blood supply

of their own, being dependent on adjacent structures, and diffusion for their viability Corneal grafts are frequently infiltrated with scar tissue and become opaque so that the success of the operation, which may be great at first, is gradually diminished with time and the graft becomes useless The same is true of cartilage for if it is progressively absorbed by the host it loses its definition and later the deformity recurs

One of the most interesting advances in plastic surgery has been the development of the use of adjacent tissues, to shift them to cover or to close a defect with contiguous structures This is a relatively old procedure which has been modified and developed, particularly by men like Ferris Smith, who has utilized this procedure whenever possible to bring skin from the neck, for example, up to replace a portion of the face This is done by multiple, gradual excision of the lesion, a method first proposed by Morestin of France, and has been greatly modified and amplified in Smith's hands Where this can be done, the best cosmetic effect is secured though the number of operations entailed may be long and arduous

SUMMARY

The role of the plastic surgeon has become increasingly defined and his field extends from the head to the feet, involving all the structures that are damaged or deformed Much of his work is cosmetic, but a great portion of it is reconstructive To this end, he uses meticulous technique and is ready to deal with the transplantation of skin, fat, fascia, bone, cartilage, tendon or other structures deemed necessary in the reconstruction The attempt is to restore the part to its greatest usefulness and to return it to as near a cosmetic normal as possible Plastic surgeons are united in the attempt to extend their field of usefulness and to propagate information referable to the problems which are peculiar to their type of surgery Further advances are being made in the field every year and one can confidently look forward to additional advances being made in the future

BIBLIOGRAPHY

Aufricht, Gustave The Development of Plastic Surgery in the United States, *Trans Amer Soc Plastic and Reconstruct Surg*, 13th Annual Meeting, p 9, 1944

Blair, Vilray P The Role of the Plastic Surgeon in the Care of War Injuries, Trans South Surg Assn , *53*, 56, 1940

Davis, John Staige The Story of Plastic Surgery, Trans South Surg Assn , *53*, 1, 1940

JAMES S SIMMONS

~ 14 ~

PREVENTIVE MEDICINE AND PUBLIC HEALTH

By James S Simmons, S B , M D , Ph D ,
Dr P H , S D (Hon)

Brigadier General, U S Army (Retired) Dean and Professor, Harvard University, School of Public Health, Boston, Massachusetts, Former Chief Preventive Medicine Service, Office of the Surgeon General, U S Army, 1940–1946

THE historian of the future—whether he writes from the vantage point of 5000 A D or later—will still be able to highlight the last one hundred years as a unique period in the annals of human progress The period from 1850 to 1950 will always be remembered as a time of rapidly mounting interest in the experimental search for truth It was a revolutionary time when many ancient professions were transformed into modern sciences and a time of hope and excitement when new sciences were born In brief, the century just passed marks the beginning of a new scientific era in the age long evolution of man

Undoubtedly, the future historian will mention some of the discoveries that are being used today to help meet our needs and desires For example, electricity and its adaptation to the supply of light and power instantaneous communication by telephone, telegraph radio and television, rapid transportation by ship, train and airplane refrigeration and the conservation of food, atomic power and its use in modern war fare, etc If he is a really wise historian—and not just a recorder of the political ups and downs of parliaments kings, and dictators—he will show that the most constructive advance during this century of progress was the birth of modern, scientific medicine and of its vigorous offspring preventive medicine and public health If he is also a philosopher he may speculate as to why the earth's most intelligent mammal, *Homo*

sapiens, waited more than a million years to learn that the infectious diseases that had always plagued him were caused by living parasites, and why it was not until the early days of the present generation that civilized man began to develop effective methods for the conservation of his health

This volume issued under the auspices of the World Medical Association celebrates seventy five years of medical progress in the Western Hemisphere, and the present chapter is concerned with important achievements in preventive medicine and public health in the Americas The full record of this medical march of progress is an exciting story of high adventure and accomplishment It includes the beginnings of modern medicine and the basic discoveries in the biological sciences from which the science of medicine has grown While the chapter is primarily concerned with the Americas the background of the story is global It deals with the gradual application of this new knowledge to the specific diagnosis and treatment of certain infectious diseases, with the evolution and growth of epidemiology, and the tardy development of methods for disease prevention Finally, the story is concerned with the present widespread interest of the public in using these medical advances to conserve the physical and mental health of men, women and children throughout the Americas and in all parts of the world The extent of this progress in preventive medicine and public health can be visualized by comparing health conditions in the Western Hemisphere during the past with the situation today

PLAGUES OF THE RECENT PAST

Many Americans now living can recall the time, not so long ago when good health was not taken for granted Those who have reached the age of seventy five years were born in a period when there was real respect for the epidemic diseases that had ravaged the countries of the Western Hemisphere since the days of Columbus or longer

In the summer of 1878 one of these scourges yellow fever, which had long been prevalent in Latin America, reappeared in the City of New Orleans Its occurrence was noted in the New York *Times* of July 24, which told of 4 deaths occurring in forty-eight hours Before the end of the month the newspapers announced that other cities up the Mississippi had become alarmed and were establishing a rigid quarantine against vessels and people from New Orleans In spite of this, the disease spread rapidly up the river, causing serious outbreaks in eight states and hysterical fear which permeated the entire South The worst hit city was Memphis Tennessee Thirty thousand of its 50 000 people fled Of the 20 000 who remained, over 17,000 developed yellow fever within three months and 5,000 of these people died Many of those who ran away carried with them the seeds of yellow fever and set up new out

breaks in other parts of the country Even the medical personnel who stayed to care for the sick were attacked, and in one group of 39 volunteer helpers, 32 developed yellow fever and 12 died The cost of this one great epidemic in suffering, lives and money was enormous New Orleans, Vicksburg and Memphis bore the brunt of the epidemic but hundreds of other cities, villages and communities were attacked Cincinnati established a quarantine against Louisville, commerce was practically stopped in the lower Mississippi Valley, and the economic loss was estimated in the millions of dollars

While this was an unusually bad epidemic, such an invasion of the United States by yellow fever was not unusual The disease had been common in tropical American countries at least since the early days of Spanish colonization, and, since 1693, similar outbreaks had occurred at intervals in various North American ports, including New Orleans, Philadelphia, New York, Boston and even Quebec It was during the severe Philadelphia epidemic in 1793 that Benjamin Rush and the Philadelphia College of Physicians advocated burning gunpowder to stop the disease, and this advice resulted in a great firing of cannon at the height of that epidemic

The medical profession was still helpless during the 1878 epidemic, because no one knew what caused yellow fever or how it was spread, and therefore no one knew how to cure it or how to prevent it It was not until 1901 that Major Walter Reed confirmed the belief of Dr Carlos Finlay that yellow fever was carried by *Stegomyia* mosquitoes, and proved that it is caused by a filtrable virus Until this information became available, yellow fever continued to emerge from its jungle reservoirs in South America and Africa and attack the cities of North and South America at will The last invasion of the United States occurred in 1905

American citizens seventy five years ago were not only exposed to yellow fever but to a host of other diseases of unknown etiology Malaria was almost universal, both in the tropics and in the temperate regions and the disability and mortality were enormous Epidemic European typhus had invaded the new world repeatedly, coming from Spain to the Latin American countries and from Ireland and elsewhere to the United States During the first half of the 19th century North and South America suffered from the great pandemics of Asiatic cholera, a terrifying disease which had emerged from its age old reservoir in the Ganges and followed the trade routes to spread sickness and death over the entire world In addition to these spectacular invaders our forebears were afflicted by all of the common infectious diseases of mankind Vaccination was known, but not widely used and smallpox was common Typhoid, the dysenteries meningitis the pneumonias diphtheria and the childhood infections all caused such high mortality that some of the life insurance companies operated on the assumption that a child at birth could be expected to live only about twenty-eight to thirty years

The physicians of seventy five years ago did their best to control the prevailing diseases, but the profession was still hampered by ignorance and superstition inherited from the past Much of their thinking was still confused by the erroneous Hippocratic concept of an "epidemic constitution of the atmosphere" Early leaders of medical opinion, including Cotton Mather, Sydenham, Noah Webster and Benjamin Rush had ascribed infections either to the wrath of God, to mysterious "telluric" influences, or to vague miasmatic emanations from decaying organic matter As late as 1882, the Providence, Rhode Island, Superintendent of Health published the following statement in an official report "I have known one case in this city where nearly all the inmates of a large house had typhoid fever from the decomposition of a large quantity of potatoes in the basement" Even in the next decade, medical literature contained references to the "zymotic," or fermentative, diseases—a term applied to such specific infections as Asiatic cholera, smallpox, typhus, diphtheria, dysentery, typhoid, whooping cough and syphilis

Living as we do in the present age of sanitation, antibiotics and DDT, it is difficult to picture the frustrating situation faced by the medical profession in 1878 The medical journals were filled with speculation about disease etiology and heated controversies about prevention and treatment The American Medical Association, formed thirty two years earlier, held its 1878 meeting in Buffalo, New York, and the President, Dr Richardson, urged better education of the public in regard to health and the creation of state boards of health, and be insisted that the prevention of illness was the American Medical Association's proper field of activity The American Public Health Association, established five years earlier by Dr Stephen Smith, also met in 1878 and devoted much time to the prevailing epidemics and to speculation concerning the causes of yellow fever, cholera, typhus and other important diseases As the people were thoroughly frightened by the destructive yellow fever epidemic of that year, the United States Congress appointed a special commission to investigate and determine the causes and methods of cure of yellow fever Needless to say, it required more than a Congressional order to produce the answer to this puzzle

THE BIRTH OF SCIENTIFIC MEDICINE

In 1878, however, logical minds were beginning to think seriously about the problems of disease and a few scientific men were beginning to replace speculation concerning the etiology of epidemics with an experimental search for truth In France, an inspired chemist, Louis Pasteur, had been elected to the French Academy of Medicine in recognition of his researches on fermentation, his studies on the diseases of silk worms and his revolutionary "germ theory" of disease, and he was continuing the work which would eventually provide information about the treatment

of rabies and other diseases In England, Lister had developed his so-called "antiseptic" operating technique a few years previously In Germany, a country doctor, Robert Koch, was deep in the pioneer bacteriological studies that provided answers to the etiology of anthrax, tuberculosis, cholera and other infections

These early workers in medical microbiology, and their associates, stimulated other researches by many investigations throughout the civilized world Before 1890, the following organisms were incriminated as causes of disease *Borrelia recurrentis* (Obermeier 1873), *M leprae* (Hansen 1874), *E histolytica* (Losch 1875), *B anthracis* (Koch 1876), *N gonorrhoeae* (Neisser 1879), *E typhosa* (Ebert 1880), *P vivax* and *P malariae* (Laveran 1880), *D pneumoniae* (Pasteur Sternberg 1880), *M tuberculosis* (Koch 1882), *C diphtheriae* (Klebs 1883), *C tetani* (Nicolaier 1884), *N intracellularis* (Marchiafava and Celli), *V comma* (Koch 1884) *E coli* (Escherich 1886) and *Br melitensis* (Bruce 1887)

During this same era of discoveries, the foundation was laid for another new science—medical entomology In 1877, Patrick Manson in Hong Kong showed that mosquitoes can carry the microfilaria of *M bancrofti*, and in 1881 Carlos Finlay in Cuba believed he had transmitted yellow fever through *Stegomyia* mosquitoes Eight years later, Theobald Smith described the transmission of the organism of Texas cattle fever by ticks

Such a rich harvest of new scientific facts naturally intensified the interest in research, and the medical revolution continued to gain momentum In 1890, von Behring discovered diphtheria antitoxin, thus making available the first of the series of effective weapons including today's toxoids, for the cure or prevention of this disease In 1889, Victor C Vaughn, at the University of Michigan, opened a special laboratory for teaching and research, and other pioneer American scientists, including Welch, Sternberg, Billings, Osler, Chapin and others, were actively interested in the new science of medical microbiology During 1891 Robert Koch established the Institute for Infectious Diseases in Berlin and Alexander Abbot went to the University of Pennsylvania to develop a hygiene laboratory started by Col Billings George M Sternberg, who in 1880 had translated an early French book on bacteria, published his own comprehensive manual of bacteriology in 1892 In the next year, 1893, when Sternberg became Surgeon General of the United States Army, he established the Army Medical School in Washington for research and training in military preventive medicine and appointed Major Walter Reed as its first Professor of Bacteriology

The last seven years of the century were crowded with experimental activity and still more organisms were discovered These included the influenza bacillus (*H influenzae*—Pfeiffer 1892), the Welch bacillus (*Cl welchii*—Welch and Nuttall 1892), and the bacillus of plague (*P pestis*—Yersin Kitasato 1894) In 1894, Bruce began his work on nagana in Africa which led to the incrimination of tse tse flies as vectors of trypan-

osomiasis The same year Patrick Manson suggested to Ronald Ross that the parasites of malaria might develop in the body of the mosquito and be transmitted from man to man in this way In 1895, Ross went to India to test Manson's theory, and by 1897 he had shown that anopheles mosquitoes can transmit human malaria—an observation confirmed almost simultaneously by the Italians, Grassi, Bignami and Bastianelli In 1898, the year of the Spanish American War, Shiga in Japan incriminated the dysentery bacillus that bears his name At the end of that war, Surgeon General Sternberg sent Major Walter Reed and the United States Army Yellow Fever Commission to Cuba, and by 1901 these scientists proved that yellow fever can be transmitted through *Aedes* mosquitoes and that the disease is caused by a filtrable virus

THE EVOLUTION OF PREVENTIVE MEDICINE

Thus the medical profession entered the present century armed with much information about the causes of many serious diseases, and with intelligence about the transmission of two most important scourges of the Western Hemisphere—malaria and yellow fever

Our historian of the future, or a man from Mars, might speculate as to why these new facts were not used immediately to wipe out these diseases in the New World He might wonder why, with vaccination available for many years, smallpox continued as a major scourge throughout the Americas until after World War I He might be surprised that typhoid—the agent of which was discovered in 1880—was still a major cause of disability and death in American troops as late as the Spanish American War He might be astounded that the crippling diseases, yellow fever and malaria, both of which were swept out of pest ridden Havana in a few months by Gorgas, continued to hamper progress in the tropical and temperate regions of the entire hemisphere until recent years

There are of course various explanations for these delays The most important reasons are first, in 1900 there was still much to be learned about the epidemiology of the infectious diseases, including the facts of life about the causative micro-organisms and the manner in which they travel from man to man The second important reason for this delay in application was the need to educate the public concerning the possibilities of disease prevention and to develop practical and economical methods for health conservation

Outstanding early examples of practical application were afforded by the elimination of yellow fever and malaria from the City of Havana referred to above, and by the sanitary triumph of General Gorgas in the control of these diseases during the construction of the Panama Canal, from 1904 to 1914 These lessons were later applied on a limited scale in other parts of the Americas, but the high cost of mosquito control limited its application on a continental scale until recent years when the

more economical insecticides developed during World War II became available for civilian use

The search for additional disease agents and better preventive methods continued during the present century, and increasing attention was paid to the epidemiology of disease By 1903, it became known that plague is primarily a disease of rats and other rodents transmitted by fleas to man, and the reservoir of sylvatic plague was identified in California in ground squirrels In 1906, King and Ricketts independently showed that Rocky Mountain spotted fever in guinea pigs could be transmitted by the wood tick, *Dermacenter andersoni,* and subsequently the causative agents of typhus and other rickettsial infections were discovered In 1908, General F F Russell of the United States Army developed the triple typhoid vaccine which has been used successfully in two world wars, and, in 1909, Carlos Chagas, a Brazilian scientist, discovered that South American trypanosomiasis is carried by the assassin bug, *Triatoma megista*

Along with these advances, medical education was improved in the Western world and the practice of medicine and its specialties became increasingly more efficient However, medical training was concerned largely with the diagnosis and treatment of the sick and injured, and the first medical school in the United States to establish a department of preventive medicine was Harvard, in 1909 This lead has since been followed by other institutions, and today most of the leading medical schools have departments of preventive medicine

This emphasis on prevention is logical because the medical profession has an obligation to protect the health of all the people In meeting this responsibility the profession is concerned with two important jobs The first is to treat the sick and injured and try to restore them to health The second is to try to keep well people well The first of these functions has been met with rapidly increasing efficiency The second, which includes not only preventive services to the individual but to the community, has been performed less effectively One reason for the slower growth of preventive medicine has been the greater emphasis on curative medicine, the delayed provision of postgraduate training facilities and the early prostitution of official public health jobs by politicians

However, it gradually became apparent that trained health specialists are needed to head up community health agencies and postgraduate schools were established to train the personnel required In 1913, the Harvard Massachusetts Institute of Technology School of Public Health was established in Boston under the leadership of Sedgwick, Rosenau and Whipple At present, there are ten accredited postgraduate schools of public health in the United States, and similar schools are now operated in other countries of the Western Hemisphere

During the last two decades rapid advances in health have been made in all parts of the hemisphere These advances can be measured in

terms of the increased life span of the various people of the Americas and in terms of greater productivity Using the United States as an example, a baby born in 1878 had a life expectancy of from twenty eight to forty years In 1900, a child could be expected to live forty seven years Its descendants born in 1953 have a life expectancy of about sixty-eight years Likewise, the crude death rate for the United States which was 17 per thousand in 1900 is now less than 10 Also, there has been a gratifying decrease in the mortality of mothers and infants in this country Preventive measures in obstetrics and pediatrics have cut down maternal and infant mortality The infectious diseases of childhood are still abundant but they no longer cause the high death rates of the recent past Since 1900, there has been a reduction of about 97 per cent in the combined death rate for measles, scarlet fever, whooping cough, and meningitis The morbidity and mortality rates for respiratory, intestinal, venereal and insect borne infections have decreased Within the last few years, for example, malaria has almost been wiped out of the Southern states This has resulted from the intensive use of DDT and other insecticides, and continuation of the enormous mosquito control program initiated during World War II by the Army and operated with the help of the civilian public health services

The vital statistics for other countries of the Western Hemisphere differ widely, but in most instances they also show a marked improvement in health

To attempt to enumerate the many factors which have contributed to all this improvement would take us into many fields, including all the specialties of both medicine and public health The basis for the progress made has been experimental research, and the application of the new discoveries to the needs of the people

Some of the most useful medical discoveries of the century resulted from the gigantic program of research initiated by the Armed Forces during World War II to protect allied troops The new vaccines, the antibiotics and the insecticides developed through the initiative of the Preventive Medicine Service of the United States Army are now being used extensively for the protection of civilian health DDT and its derivatives are being applied successfully throughout the world for the control of insect borne diseases, including typhus plague, malaria, filariasis dengue fever and yellow fever

Through the sponsorship of the Pan American Sanitary Bureau, which completed fifty years of health cooperation in the Americas in December, 1952 a great insect-control program has recently been launched by the Central American governments with the assistance of the World Health Organization and other international agencies The primary objective is to control malaria and eradicate *Aedes aegypti*, the urban vector of yellow fever The campaign is also directed against such insect borne diseases as onchocerciasis Chagas disease, filariasis and typhus, which

are prevalent in various parts of Latin America This program is of service to about 9 million people and already it is beginning to produce spectacular results

Before the program started, the malaria mortality in Guatemala was as high as 432 per 100,000 persons, and approximately 75 per cent of the population were infected The situation was comparable in other regions In the last few years, however, the rates have generally decreased, and in Costa Rica the malaria rates have been cut in half

In Brazil, a program to eradicate *Aedes aegypti* is almost complete, and it is claimed that the danger has been removed of an urban epidemic of yellow fever in Brazil's cities and ports—even should additional outbreaks of jungle yellow fever occur, as was the case in March, 1952

An effective yellow fever vaccine of the type used by the United States Army during World War II is now being prepared in three special laboratories of the Western Hemisphere (1) The U S Public Health Service Laboratory at Hamilton, Montana, (2) The Oswaldo Cruz Institute in Rio de Janeiro, Brazil, and (3) The Carlos Finlay Institute in Bogota, Colombia

In addition to this intensive attack on the insect borne diseases, practically all the countries in the Western Hemisphere have been strengthening their total health programs during the last two decades

THE MEDICINE OF THE FUTURE

These modern advances in preventive medicine and public health, all made in a short period of time, point the way to the medicine of the future However, there are still unsolved problems both in curative and preventive medicine In the United States current reports show that large numbers of people are still disabled or killed each year by diseases and accidents, many of which are preventable Last year more than 2 million cases of infectious disease were reported by practicing physicians, and a large proportion of these were the diseases of childhood The preventable intestinal, venereal and insect borne diseases still produce large numbers of infections yearly, millions are killed and injured each year by accidents, and the country labors under an enormous burden of mental diseases, cancer, and the chronic diseases of old age

Faced by these unsolved health problems and living under the constant threat of another unprovoked global war, it is important for the medical profession of the Western world to re-examine with a critical eye the manner in which it is meeting its obligations to the people If the peace-loving nations of the Western Hemisphere and of the world are to meet the challenge of the future, the profession of medicine and its offspring, the profession of public health, must work together for the conservation of human manpower and strength To do this, they must provide united leadership and guide our statesmen and our people to better health

through the development of more effective national and international health programs These programs should include provision for the best possible medical and surgical care and at the same time they should provide effective programs of preventive medicine This is in keeping with the traditional objective of the medical profession, which is to conserve human life and health

There are two main approaches to the fulfillment of this objective The first is through the treatment and care of the sick and injured, and in this service the physicians of the Americas have excelled The second approach is through the prevention of disease and accidents, and in this there is much room for improvement Both services are essential to the conservation of health and manpower, and both are a primary responsibility of the profession of medicine

If we are to visualize these responsibilities clearly, we must penetrate further the fog of confused thinking which has delayed the full development of adequate health protection and accept the simple truth that an ounce of prevention is really worth a pound of cure

So called "socialized medicine" is not the answer to public health in the Americas No utopian law providing a dole in the form of government insurance to pay for medical care can protect the citizen against accidents or sickness The construction of more expensive hospitals, even if they were staffed by the best clinicians in the world, would not of itself prevent disease The people deserve first class medical care and it is believed that in most countries they are receiving it Certainly, insurance to help pay for the high cost of illness is important, and with the development of more satisfactory forms of voluntary medical care insurance, it is hoped that this need will eventually be met

The physicians of the Western Hemisphere, together with their co workers throughout the world, are now seriously concerned with their responsibilities as leaders of the people in all aspects of health conservation Armed with the increased knowledge provided during the last seventy five years, they are now in a position to broaden their services both in curative and preventive medicine

As we face the health challenge of the future, the first job is of course to reduce—and, if possible, to eliminate—the remaining load of preventable diseases and accidents The second job is much more difficult, it calls for more research aimed at the development of better methods with which to prevent the still unconquered infections of childhood, the increasing load of old age diseases and disabilities, and the almost overwhelming burden of mental diseases These unsolved problems should be attacked just as the pioneer microbiologists a few generations ago tackled the even greater mystery of the epidemic infections Intensive research is required to ferret out their causative factors and to discover new methods of control Also, an alert, well trained body of professional workers is needed to apply this new knowledge effectively

The experience of World War II has convinced even the layman of the importance both of public health and research. Large amounts of money are now being spent on the investigation of all sorts of health problems. Well-known examples are the extensive researches on infantile paralysis, accidents, arthritis, heart disease, cancer, the disabilities of old age, rehabilitation and mental diseases. As answers are obtained, they should be applied without delay.

It should be pointed out that the application of preventive knowledge is not a job which can be delegated to the professional health worker alone. Disease prevention is a basic human service and the responsibility for rendering such service must be shared by the professions of medicine and public health. The general practitioner of medicine can increase his contribution to community health by following the example of the up-to-date specialist in pediatrics, who is not only concerned with the treatment of his patients but with keeping them well. All the hospitals can help enormously in disease prevention by following the lead of the relatively small group of hospital administrators who are now practicing good preventive medicine. Such hospitals really serve as supplemental health centers for their communities. Members of their staff are not only concerned with the recovery of their patients, but with the maintenance of good health among the families and in the areas which they serve.

The practicing physician also has an obligation to see that the agencies organized to operate his community, state and federal health programs are properly staffed, guided and supported. Such public service is taken for granted by physicians of vision in many communities. It should become a part of the daily life of every member of the medical profession.

If preventive medicine is to perform its function in the future, its constructive objectives will have to be adopted by all of our medical schools. The teaching of preventive medicine cannot be relegated to a subsidiary place in the curriculum, but must be carefully organized as a strong department staffed by stimulating, effective teachers of broad vision. Also, the enlightened principles of preventive medicine should be accepted, practiced and taught by every member of the medical faculty, including the surgeon and the internist; and young physicians should be encouraged to enter the constructive specialty of public health. When this has been done, we can hope to develop within a relatively short time a new generation of physicians who are armed with a broader concept of their professional duties and a more satisfying vision of their opportunities for national and international service.

The medical profession has a proud record of accomplishment. Within the life span of a single generation it has become highly proficient in the treatment of the sick. Its members have given the major leadership in the development of the specialties of preventive medicine and public health. It is now ready to make its greatest contribution through the prevention of disease.

through the development of more effective national and international health programs. These programs should include provision for the best possible medical and surgical care and at the same time they should provide effective programs of preventive medicine. This is in keeping with the traditional objective of the medical profession, which is to conserve human life and health.

There are two main approaches to the fulfillment of this objective: The first is through the treatment and care of the sick and injured, and in this service the physicians of the Americas have excelled. The second approach is through the prevention of disease and accidents, and in this there is much room for improvement. Both services are essential to the conservation of health and manpower, and both are a primary responsibility of the profession of medicine.

If we are to visualize these responsibilities clearly, we must penetrate further the fog of confused thinking which has delayed the full development of adequate health protection and accept the simple truth that an ounce of prevention is really worth a pound of cure.

So-called "socialized medicine" is not the answer to public health in the Americas. No utopian law providing a dole in the form of government insurance to pay for medical care can protect the citizen against accidents or sickness. The construction of more expensive hospitals, even if they were staffed by the best clinicians in the world, would not of itself prevent disease. The people deserve first-class medical care and it is believed that in most countries they are receiving it. Certainly, insurance to help pay for the high cost of illness is important, and with the development of more satisfactory forms of voluntary medical care insurance, it is hoped that this need will eventually be met.

The physicians of the Western Hemisphere, together with their coworkers throughout the world, are now seriously concerned with their responsibilities as leaders of the people in all aspects of health conservation. Armed with the increased knowledge provided during the last seventy-five years, they are now in a position to broaden their services both in curative and preventive medicine.

As we face the health challenge of the future, the first job is of course to reduce—and, if possible, to eliminate—the remaining load of preventable diseases and accidents. The second job is much more difficult; it calls for more research aimed at the development of better methods with which to prevent the still unconquered infections of childhood, the increasing load of old age diseases and disabilities, and the almost overwhelming burden of mental diseases. These unsolved problems should be attacked just as the pioneer microbiologists a few generations ago tackled the even greater mystery of the epidemic infections. Intensive research is required to ferret out their causative factors and to discover new methods of control. Also, an alert, well-trained body of professional workers is needed to apply this new knowledge effectively.

The experience of World War II has convinced even the layman of the importance both of public health and research Large amounts of money are now being spent on the investigation of all sorts of health problems Well known examples are the extensive researches on infantile paralysis, accidents, arthritis, heart disease, cancer, the disabilities of old age, rehabilitation and mental diseases As answers are obtained, they should be applied without delay

It should be pointed out that the application of preventive knowledge is not a job which can be delegated to the professional health worker alone Disease prevention is a basic human service and the responsibility for rendering such service must be shared by the professions of medicine and public health The general practitioner of medicine can increase his contribution to community health by following the example of the up to-date specialist in pediatrics, who is not only concerned with the treatment of his patients but with keeping them well All the hospitals can help enormously in disease prevention by following the lead of the relatively small group of hospital administrators who are now practicing good preventive medicine Such hospitals really serve as supplemental health centers for their communities Members of their staff are not only concerned with the recovery of their patients, but with the maintenance of good health among the families and in the areas which they serve

The practicing physician also has an obligation to see that the agencies organized to operate his community, state and federal health programs are properly staffed, guided and supported Such public service is taken for granted by physicians of vision in many communities It should become a part of the daily life of every member of the medical profession

If preventive medicine is to perform its function in the future, its constructive objectives will have to be adopted by all of our medical schools The teaching of preventive medicine cannot be relegated to a subsidiary place in the curriculum, but must be carefully organized as a strong department staffed by stimulating effective teachers of broad vision Also, the enlightened principles of preventive medicine should be accepted, practiced and taught by every member of the medical faculty, including the surgeon and the internist, and young physicians should be encouraged to enter the constructive specialty of public health When this has been done, we can hope to develop within a relatively short time a new generation of physicians who are armed with a broader concept of their professional duties and a more satisfying vision of their opportunities for national and international service

The medical profession has a proud record of accomplishment Within the life span of a single generation it has become highly proficient in the treatment of the sick Its members have given the major leadership in the development of the specialties of preventive medicine and public health It is now ready to make its greatest contribution through the prevention of disease

SUMMARY

In this brief sketch we have considered a few of the many important events which have revolutionized medicine and brought better health to the Western Hemisphere during the last seventy five years The progress made will always stand out as a high point in human progress During this short period, man has learned that many of his diseases are carried by living parasites and he is now able to do something constructive about protecting his health Armed with exact knowledge, the profession of medicine has grown from a speculative art to an effective profession founded on scientific knowledge

Not too long ago one of the world's most distinguished clinicians made the prediction that "preventive medicine is the medicine of the future" This poses a question of vital importance to all of us Every physician should ask himself what he and his profession are doing to keep people well and on the job, what he is doing to prevent disease, conserve health and keep people out of hospitals These questions have the potentialities of an atom bomb They pose today's challenge to our profession of medicine

LOUIS J. HIRSCHMAN

~ 15 ~

PROCTOLOGY

By Louis J Hirschman, M D , F A C S , F A P S (Hon)

Founder and Emeritus Professor of Proctology, Wayne University Medical College, Detroit, Michigan

AS ONE views in retrospect the birth and development of a special field of medicine over the past three quarters of a century, especially as these events have occurred during one's lifetime, the stupendous progress of the science of medicine and particularly of the special field of proctology is almost beyond belief

The successful development and establishment of a firm, rational and permanent foundation of any special field of medical endeavor presup poses the missionary zeal and pioneer spirit in our profession that has made America great

In this limited space there will be no attempt to list chronologically the names, dates and contributions made to the development of the specialty of proctology, and the thousands of published articles and hundreds of books authored during the period covered by this chapter

Our confreres in Great Britain showed earlier interest in diseases of the colon, rectum and anus than did we in America In fact, they are fortunate in possessing, for well over a century, the first hospital (St Mark's of London) devoted to the special treatment of proctologic diseases

In the year 1878, at the beginning of this seventy five years of medical progress, Joseph McDowell Mathews, M D , of Louisville, Kentucky, returned from an illuminating and stimulating visit to London, imbued with the idea of devoting the remainder of his professional life to the development of the special study and treatment of diseases of the colon, rectum and anus Since he was a very busy general surgeon of high repute in his own state of Kentucky, his voice was listened to with respect and confidence From his return in 1878 until the year 1899, when he was elected president of the American Medical Association, he worked un ceasingly for the relief of the 'forgotten man,' the proctologic patient He constantly strove to interest and to instruct other general surgeons from the various parts of the country in his chosen special field

During this period a small group of prominent surgeons from different medical centers realized that there was much more to proctology than the ability to cut a fistula, or to tie or burn a "pile"

In the field of general surgery the best trained and keenest observers soon realized that diagnostic methods as well as the preparation and after care of patients suffering from pathology of the terminal portion of the gastro intestinal canal required more time, thought and care before and after operation, than they could afford for one group of patients in a large surgical practice

In Great Britain, as well as in the United States, this same feeling of dissatisfaction was growing, but from an earlier start

In 1899, while presiding at the session of the American Medical Association at Columbus, Ohio, Dr Mathews called together thirteen prominent surgeons of this country who already were limiting themselves to the practice of proctology They met and organized the American Proctologic Society which today, after fifty four years of steady growth, dominates the field of proctology in the Western Hemisphere

It will be noted that in the Articles of Association of the American Proctologic Society its aims and objects were stated as "the study and dissemination of knowledge concerning diseases of the colon, rectum and anus"

It is a long cry from the injection of irritating and astringent chemicals and the occasional cauterization or ligature of internal hemorrhoids under chloroform anesthesia, to the present day complete one stage operation for the removal of the colon

Another great step was the transition from the breathing type of anesthesia to the regional caudal, intravenous, or spinal administration which is employed for the majority of colonic operations today

With the formation of the American Proctologic Society, this second era born with the century was marked by the creation and use of simplified methods made available by the rapidly advancing progress of diagnostic techniques These included the use of *x* ray, and a growing interest in the patient as an *individual* suffering from a disease, rather than the treatment of the disease itself Physicians were beginning to think of a patient as a *person* who was sick and afflicted and who needed sympathetic understanding of the *individual* as well as of his illness The increasing knowledge of the afflictions of the human body, especially their relation to the disturbed and abnormal mind was of infinite value in the treatment of proctologic patients

Better psychological preparation of the patient as well as a better evaluation of the findings secured by improved diagnostic methods which were coming into general use, and more intelligently and humanely employed, were eagerly grasped by and utilized by the proctologist

In the early days in patients requiring proctologic examination instrumentation was rather primitive The average patient was exam

ined by a cursory external inspection and a digital examination and, of course, in those days rubber gloves were unknown The instruments consisted of a bivalve speculum, a simple metal tube called the proctoscope or rectoscope, and perhaps a stiff metal probe At least the employment of the proctoscope was more humane than the insertion and forcible dilatation of the bivalve speculum

The only light available in those days was secured by reflection of daylight or the electric bulb by means of the head mirror With the development of the miniature electric light for the various scopes a new and tremendously interesting field of diagnosis was brought into use The era of the electric lighted proctoscope and sigmoidoscope really and literally led the proctologist out of the darkness and into the light! This and the discovery and use of the roentgen ray with the administration of opaque meals and enemas in the diagnostic study of the entire gastro intestinal tract, really inaugurated the "Golden Age of Proctology"

Progress was already being made in the teaching and practice of proctology in hospitals, medical schools and post graduate institutions Interest in proctology was growing by leaps and bounds so that in 1913 a movement was inaugurated to form a Section of Proctology within the American Medical Association As a matter of compromise the proctologists combined with the gastro enterologists and in 1917 the first meeting of the Section of Proctology and Gastro Enterology was held in New York City

This inaugurated a third era in proctology, as now the many Fellows of the American Medical Association who were interested in the growing specialty had a common meeting place to present, discuss and exchange their views and try to solve their problems Also groups of proctologists were forming local, state and regional proctologic societies and a number of state medical associations instituted sections of proctology

With the growth of the specialty and the increasing number of colleges and hospitals which were establishing departments and sections of proctology, the increasing need for resident training was becoming apparent Those proctologists who were leading in the teaching and development of this specialty, along with other great specialty groups, were feeling the necessity of strict regulation and certification Proctology was the fourth such specialty group to initiate a certifying board In 1933, there were approximately one thousand physicians designated in the directory of the American Medical Association as proctologists In 1935, the American Board of Proctology was organized and chartered by the State of Delaware The first board was composed of representatives from the American Proctologic Society, the Section of Gastro Enterology and Proctology of the American Medical Association and the Section of Proctology of the Southern Medical Association After a prolonged and persistent up hill fight this board was authorized by the Council on Medical Education and Hospitals of the American Medical Association,

and the Advisory Board of Medical Specialties to proceed to examine candidates for certification This board functioned as a certifying committee under the American Board of Surgery until 1940, an arrangement highly unsatisfactory to the general surgeons, the proctologists and the candidates for examination Hence in 1945 the American Board of Proctology was granted full independence and it has been functioning successfully ever since There are at present two classes of diplomates (1) those who are certified in ano rectal surgery only, and (2) those that practice complete proctology (colon and rectal surgery) It is anticipated that after 1954, the first classification will be discontinued

At the present time (September, 1953), 230 proctologists are diplomates of the American Board of Proctology, and there are 337 applications for authorization to take examinations for certification Between 60 and 80 candidates are being examined annually

While proctology has made great progress in the United States and in Great Britain, let it not be forgotten that impressive strides were being taken in the other countries of the Western Hemisphere as well A brief mention of the progress made in the diagnosis and treatment of a few of the more typical proctologic diseases follows

CANCER

Malignancy is, of course, in proctology, as in all other departments of medicine, our greatest problem But because of the improved intensive study of each patient and better diagnostic methods being developed, this disease is being discovered and treated much earlier in its progress than in the earlier days Here the closer cooperation of the patient's family medical advisor and the specialist in proctology, as in other fields, is paying great dividends to the patient in earlier relief and more frequently cure of what used to be termed a "hopeless and fatal" malady

Here, regardless of the paucity of symptoms in the silent case, the routine proctologic study of the patient, including a general physical examination, laboratory examination of the various body fluids, cytology, biopsy, sigmoidoscopy, and gastro intestinal roentgenology, is often the means of the discovery of a lesion early enough to be successfully removed or treated

We are all looking forward to the development of some biological, chemical or other specific test which will give us a clue to a *pre malignant* condition or a tendency to malignancy, or the very early presence of a malignant neoplasm At the present time any appearance of blood or other unusual discharge at the anal orifice or accompanying or mixed with the feces, should demand a complete proctological examination A feeling of weakness, fatigue, loss of appetite, indigestion, loss of weight, intestinal gas or any other gastro intestinal symptom, as well as change in the normal type of bowel movement, or its normal regularity or, in

fact, any departure from normal bowel habits, should call for investiga tion of the whole gastro intestinal tract, and particularly the entire large intestine

The intelligent use of the anoscope, sigmoidoscope, biopsy forceps, microscope, gastro intestinal *x* ray series, including barium enema, and the employment of air inflation of the colon, *in the order mentioned*, is imperative for diagnosis of lesions of the large bowel After diagnosis has been established and the type, grade, site, size and extent of the lesion determined, treatment presents itself There is no satisfactory non operative treatment for cancer of the rectum and colon at the present time, and no positive cure Numerous methods are constantly being studied, but, unfortunately, this seventy five year period can present nothing better than good early bold, radical surgery after a complete diagnostic study Non surgical palliative measures, including *x* ray, radium, cobalt, etc , cannot be considered here, although extremely valuable in giving comfort to many sufferers from inoperable and incur able bowel cancer

Early and wide excision of bowel containing the malignancy, along with as much of the gland bearing area as possible, as well as involved contiguous organs where compatible with life, is still the indicated pro cedure in all cases of cancer This is one place in the body where ex tremely radical and bold surgery has been found necessary to insure a reasonable amount of comfort, happiness and, in some cases, definitely the prolongation of life

The technique for the formation and the location of the colostomy after excision or excision with immediate anastomosis in suitable cases is decided by the judgment of the proctologist in the individual case

Colostomy life is no longer to be dreaded as in the early days of this century Now the development of diets, simple protective devices and intelligent daily toilet of the colon, has changed the status of the colosto mized individual to that of the ordinary member of society

The employment in suitable cases of preliminary or post operative use of *x* ray or radium therapy in conjunction with surgery is practiced by many proctologists and with encouraging success The gradual rising percentage of five year cures in colonic cancer is still a mandate to the proctologist to constantly study means of extending the frontier of cancer cures to new limits by better and earlier diagnosis improved preparation of the patient (as will be mentioned below) and by better bolder and more extensive surgery It will be impossible to even mention, let alone describe, all of the accepted operative techniques employed during the period under discussion for the operative relief of colonic and rectal cancer

There are many excellent methods of wide excision of the growth and immediate anastomosis It might be said here parenthetically that in every colonic operation abdominal incisions must be made large enough

so that the condition of the liver, the spleen and other organs can be thoroughly explored, and the extent of the spread of glandular metastases determined

In cancer of the sigmoid and sometimes the recto sigmoid, it has been found possible to save the sphincter mechanism, and to retain good bowel control This is still a controversial subject, but many patients have survived the five year period and longer with no sign of recurrence and still enjoy normal sphincter control

If some brilliant genius would discover some test to determine the tendency of colonic cancer to metastasize, the number of patients suitable for excision and anastomosis would be much larger and sphincter function could be retained in a greater percentage of cases Let us hope, with all the research being done by so many able scientists, that this next great discovery will be in the not too distant future

This golden period of medicine has decreased morbidity and increased longevity not only because of constantly improving surgical technique but because of better pre operative preparation and post operative care, not only for colonic patients, but for all types of patients undergoing proctologic surgery Much more attention is now being paid to the patient himself and his preparation for surgery is personal, sympathetic and psychological in addition to the measures directed to improving his physiological and physical resistance

His condition, diagnosis and prognosis should be freely discussed with him If inadvisable in individual cases of grave, progressive malignant disease, then near relatives should be fully informed The expected result of his operation and future condition should be fully explained, and in cases of colostomy a full description of the modern and simplified post operative and subsequent home care required

In the less serious conditions these explanations are naturally less difficult As has been mentioned above, the morale as well as the physical condition of the patient is now recognized as an important factor to be brought up to par

In the physical preparation of the patient, correction of dietary and habit errors or deficiencies is extremely important The administration of plenty of fluids, the proper vitamins, minerals and hematinics in anemic patients are all of prime importance For prophylactic reasons, antibiotics, chemotherapy, blood transfusions, intravenous medications and feedings are very important, especially before bowel surgery, minor as well as major The use of pre-operative laxatives is a matter of individual judgment Gastric and intestinal intubation to decompress distended or obstructed bowel is often vital Irrigations of the colon by non irritating solutions, not necessarily germicidal, have been very helpful before bowel surgery This goes for all types of surgery, both major and minor In colonic surgery and in lesser cases where anemia has been a factor, blood transfusion during surgery is successfully em

ployed In major colonic operations, of course, besides ample blood transfusions, the administration of amino acids, saline, glucose and other supporting intravenous measures are utilized in all bowel surgery today

Electric coagulation has been utilized in addition to meticulous ligation and suturing to control operative bleeding In the last few years various types of local blood coagulants like thrombin, oxycel, gelfoam, etc , have been used to stop otherwise uncontrollable oozing and bleeding in the pelvis and abdomen during bowel operations They are valuable also in open wounds following rectal and peri anal and perineal surgery Postoperative dressings with packs, plugs, tubes and other devices to keep the sphincter muscles "in extension" after rectal surgery, the administration of opium, bismuth, and other preparations by mouth, as well as by suppository, to retard defecation have disappeared in the new practice of proctology

Instead of large doses of purgatives, an attempt to induce normal bowel movements by the free use of lubricants and bulk hydrocylic laxatives has been found to be the better method The early use of the commode or toilet and early ambulation, deep breathing and sitting up in and out of bed are all modern aids to prompt convalescence and prevention of thrombosis, embolism and atelectasis

COLONIC SURGERY FOR NON MALIGNANT DISEASES

The principles outlined above in the treatment of malignant diseases of the large bowel are all applicable in colonic surgery for non malignant diseases In the treatment of advanced cases of multiple colonic polyposis, colonic ulcerative proctitis and colitis, benign tumors strictures deforming and obstructing adhesions, malformations, and other conditions, colonic surgery has been in the last seventy five years the means of restoring many otherwise hopeless individuals to normal useful life

DIVERSIONARY OR TEMPORARY COLOSTOMY

Great progress has been made since 1878 in the treatment of various diseases of the colon where it is not necessary to resect or remove neoplasms or diseased segments of the bowel The performance of temporary colostomy to divert the fecal current opened the way to the successful treatment of many of the non malignant diseases mentioned above, as well as in cancer surgery *Ulcerated and infected localized diseased* segments can be isolated and given physiologic rest, and local treatments can be administered through a double barrelled colostomy Multiple fistulas interfering with sphincteric function or control are being treated with complete success after diversionary colostomy has provided temporary suspension of function That has been found especially true in the operative treatment of fistulas connected with the bony structures or communicating with the genito-urinary tract and the pelvic organs

Localized diseased conditions complicating chronic ulcerative colitis are now successfully treated after colonic rest, following a temporary ileostomy in special cases Temporary cecostomy or colostomy is often a lifesaving measure in patients suffering from colonic obstruction from either malignant or nonmalignant diseases Also in the transplantation of the ureters into the sigmoid and in injuries to the colon sustained by accidents in civilian life and war wounds from battle casualties, temporary colostomy has been the means of providing better reconstructive surgery and of saving many lives

In this chapter, it has been felt essential to devote more space to the major and malignant diseases occurring in proctologic practice It will be impossible, of course, to record all of the advances in the diagnosis and treatment of all of the diseases affecting the large intestine and especially the rectum and anus Therefore, a few of the important conditions affecting the rectum and anus and the essential features in diagnosis and treatment developed since 1878 will be discussed

PAPILLITIS AND CRYPTITIS

Seventy five years ago diseased conditions of the anal papillae and the crypts of Morgagni were unrecognized as separate pathological entities With the gradual improvement of diagnostic investigation, with proper instruments these little entities at the ano rectal juncture or dentate lines were brought into view and credited with their real importance, as frequent and hitherto overlooked sources of discomfort, tenderness, itching, pain and infection Hypertrophied papillae sometimes 10 to 30 times their original size were formerly mis diagnosed as fibrous piles or skin polyps During recent years their removal, under local regional or spinal anesthesia, along with their accompanying infected anal crypts has solved many proctologic puzzles Infection of the anal crypts and their accompanying ducts is the most common cause of fistula in ano, a frequent etiological factor in pruritus ani and perinei and a very frequently overlooked focus of infection as sometimes may be manifest not only in contiguous but in distant parts of the body Cases of neuritis, neuralgia, myositis and arthritis have been relieved by eradication of the original focus of infection located in diseased anal crypts

ABSCESS AND FISTULA

No pain is more severe than that of an abscess in the perineal region, and nowhere is the early recognition and prompt treatment of such a condition more effective in the relief of suffering and prevention of destructive and sometimes disastrous fistula formation Fistula surgery was practiced thousands of years ago In fact, some interesting rectal instruments for the treatment of fistulas and other diseases were dis

covered in Egypt and in the ruins of Pompeii However, the rationale of the formation and the operative cure of fistulas has really come about in the first half of this present century It is now known that with the exception of trauma all anal fistulas are really the third stage of the disease which begins in an anal cryptitis This infection extends from the crypts along the anal ducts into the perianal tissues and terminates in abscess formation, or the second stage So fistula in this region occurs after the rupture or late incision of the preceding abscess This becomes an anal fistula or a fistula in ano, as it is known today

Traumatic fistulas, the result of gunshot or impalement injuries or from faulty instrumentation or from infected blood clot following bodily injury, are treated the same as the fistulas resulting from infected crypts or episiotomy wounds As the result of the rupture of an abscess an infected channel is found connecting bowel to integument or contiguous organ or viscus A sinus is distinguished from a fistula where the abscess ruptures only into the bowel or only on the skin surface

A major development in the diagnosis of fistulas in the last half century has been the injection of an opaque ointment or oily fluid, usually into the external opening of the fistula, and the use of stereoscopic radiography Complications, such as communications with bone or other organs, as well as size, number, direction, etc , of the fistulous channels have led to an accurate pre operative diagnosis so that the operation can be well charted in advance In the operative treatment of multiple fistulas and those communicating with the urethra, bladder, small or large intestine, or vagina, or in fistulas occurring in patients suffering also from ulcerative or infective conditions of the large bowel or colon, a diversionary colostomy is often a necessary prelude to the fistulectomy

The very successful results following modern fistula surgery are due in a large measure to the clean cut excision of infected tissues as demonstrated by the stereoscopic *x* ray and the soft flexible silver probe The temptation to pack the wounds after surgery or to attempt to secure first intention healing by sutures is something which every modern proctologist avoids The preservation of sphincter function by two or more stage operations with the employment of the conservation loop or section has been one of the major improvements of fistula surgery in the last half-century Packing fistula wounds has caused incontinence by preventing the cut edges of the sphincter muscles from re uniting and has resulted in many unnecessary secondary procedures to restore sphincter function

Great credit must be given to the epochal discovery of chemotherapy the antibiotics vitamins, hematinics, blood and other preparatory treatments of the patient as outlined above Better anesthesia germicides and hemostatics have contributed their share to the fine results which we observe in fistula surgery today

Localized diseased conditions complicating chronic ulcerative colitis are now successfully treated after colonic rest, following a temporary ileostomy in special cases Temporary cecostomy or colostomy is often a lifesaving measure in patients suffering from colonic obstruction from either malignant or nonmalignant diseases Also in the transplantation of the ureters into the sigmoid and in injuries to the colon sustained by accidents in civilian life and war wounds from battle casualties, temporary colostomy has been the means of providing better reconstructive surgery and of saving many lives

In this chapter, it has been felt essential to devote more space to the major and malignant diseases occurring in proctologic practice It will be impossible, of course, to record all of the advances in the diagnosis and treatment of all of the diseases affecting the large intestine and especially the rectum and anus Therefore, a few of the important conditions affecting the rectum and anus and the essential features in diagnosis and treatment developed since 1878 will be discussed

PAPILLITIS AND CRYPTITIS

Seventy five years ago diseased conditions of the anal papillae and the crypts of Morgagni were unrecognized as separate pathological entities With the gradual improvement of diagnostic investigation, with proper instruments these little entities at the ano-rectal juncture or dentate lines were brought into view and credited with their real importance, as frequent and hitherto overlooked sources of discomfort, tenderness, itching, pain and infection Hypertrophied papillae sometimes 10 to 30 times their original size were formerly mis diagnosed as fibrous piles or skin polyps During recent years their removal, under local regional or spinal anesthesia, along with their accompanying infected anal crypts has solved many proctologic puzzles Infection of the anal crypts and their accompanying ducts is the most common cause of fistula in ano, a frequent etiological factor in pruritus ani and perinei and a very frequently overlooked focus of infection as sometimes may be manifest not only in contiguous but in distant parts of the body Cases of neuritis, neuralgia, myositis and arthritis have been relieved by eradication of the original focus of infection located in diseased anal crypts

ABSCESS AND FISTULA

No pain is more severe than that of an abscess in the perineal region, and nowhere is the early recognition and prompt treatment of such a condition more effective in the relief of suffering and prevention of destructive and sometimes disastrous fistula formation Fistula surgery was practiced thousands of years ago In fact, some interesting rectal instruments for the treatment of fistulas and other diseases were dis

covered in Egypt and in the ruins of Pompeii However, the rationale of the formation and the operative cure of fistulas has really come about in the first half of this present century It is now known that with the exception of trauma all anal fistulas are really the third stage of the disease which begins in an anal cryptitis This infection extends from the crypts along the anal ducts into the perianal tissues and terminates in abscess formation, or the second stage So fistula in this region occurs after the rupture or late incision of the preceding abscess This becomes an anal fistula or a fistula in ano, as it is known today

Traumatic fistulas, the result of gunshot or impalement injuries or from faulty instrumentation or from infected blood clot following bodily injury, are treated the same as the fistulas resulting from infected crypts or episiotomy wounds As the result of the rupture of an abscess an infected channel is found connecting bowel to integument or contiguous organ or viscus A sinus is distinguished from a fistula where the abscess ruptures only into the bowel or only on the skin surface

A major development in the diagnosis of fistulas in the last half-century has been the injection of an opaque ointment or oily fluid, usually into the external opening of the fistula, and the use of stereoscopic radiography Complications, such as communications with bone or other organs, as well as size, number, direction, etc, of the fistulous channels have led to an accurate preoperative diagnosis so that the operation can be well charted in advance In the operative treatment of multiple fistulas and those communicating with the urethra bladder, small or large intestine, or vagina, or in fistulas occurring in patients suffering also from ulcerative or infective conditions of the large bowel or colon, a diversionary colostomy is often a necessary prelude to the fistulectomy

The very successful results following modern fistula surgery are due in a large measure to the clean cut excision of infected tissues as demonstrated by the stereoscopic *x* ray and the soft flexible silver probe The temptation to pack the wounds after surgery or to attempt to secure first intention healing by sutures is something which every modern proctologist avoids The preservation of sphincter function by two or more stage operations with the employment of the conservation loop or section has been one of the major improvements of fistula surgery in the last half-century Packing fistula wounds has caused incontinence by preventing the cut edges of the sphincter muscles from reuniting and has resulted in many unnecessary secondary procedures to restore sphincter function

Great credit must be given to the epochal discovery of chemotherapy, the antibiotics, vitamins, hematinics, blood and other preparatory treatments of the patient as outlined above Better anesthesia germicides, and hemostatics have contributed their share to the fine results which we observe in fistula surgery today

FISSURE IN ANO AND ANAL ULCER

The anal fissure is a traumatic condition, really a split through the anoderm, exposing sphincter fibers It is excruciatingly painful and is the result of trauma caused by coughing, sneezing or any unusual exertion and often by the passage of hard constipated stools Anal ulcers may follow trauma, but are usually the result of infection of the crypts of Morgagni mentioned above Formerly the treatment of these conditions was by forcible manual divulsion of the sphincter muscles, usually under general anesthesia, and often the bivalve speculum was employed In either case the sphincter muscles were always traumatized and, in some cases, incontinence occurred

The great advance made in the treatment of this simple but extremely painful condition is the incision at right angles to the direction of the sphincter fibers after the muscle has been thoroughly relaxed under the administration of local, caudal or spinal anesthesia This wound, usually triangular or diamond shaped, is never sutured but is allowed to heal from within outward, which it does in a very few days No drains of any kind are necessary and the patient is up and around immediately afterwards Unless the fissure or ulcer is a complication of other ano rectal disease the patient rarely has to be hospitalized

Fissures and ulcers may be single or multiple In the case of multiple fissures one incision is quite sufficient for the relief of all of the others In ulcers, a separate incision is made through each ulcer One point to remember, as in all ano rectal surgery, is to carry each incision well out on to the skin for drainage

HEMORRHOIDS

In the minds of many laymen and a few physicians, the chief function *of the proctologist is to treat hemorrhoids or "piles" The disease of* hemorrhoids was known and described as far back as biblical days, and is one of the commonest diseases which afflicts mankind Even seventy five years ago there had been little advance made in the palliative or in the surgical treatment of hemorrhoids Because some people thought that any rectal disease was an evidence of uncleanliness, they refrained from consulting their family physician from a sense of shame or false modesty As a result, many quacks, charlatans and imposters held themselves out to treat hemorrhoids and rectal diseases "without surgery or detention from business or one's ordinary occupation " It was really not until 1878 that reputable physicians began to realize that there was much to be desired in the treatment of the patient suffering from hemorrhoids In the early days there was no distinction made between internal and external hemorrhoids As a result of the employment of the so

called injection treatment, utilizing carbolic acid in various strengths, gangrene and infection frequently resulted from this method in external as well as in internal hemorrhoids

In the early surgical treatment of hemorrhoids general anesthetics, such as chloroform and ether, were employed The operation usually consisted of the amputation of the pile bearing area, unfortunately also frequently including portions of the sphincter muscles Another method was the use of a clamp and the burning off of these hemorrhoidal tumors with a red hot cautery Another method was the tying off of the internal hemorrhoids with non absorbable ligatures and either cutting the hemorrhoid away above the stump or, worse yet, allowing the hemorrhoids to necrose and the ligatures slough away Happily, the old "Whitehead operation" and the clamp and cautery have long since been discarded The infection, strictures and deformities and prolonged painful convalescence resulting from the use of these two methods were really a disgrace to the medical profession of those days

During the last half century, much progress has been made in rectal surgery and nowhere more than in the evolution of the operation of hemorrhoidectomy Today a hemorrhoid, which is a vascular tumor covered by either mucous membrane or skin, is treated the same as any other vascular tumor Incision or excision of excess mucous membrane or skin covering, excision of the pathological blood vessels and connective tissue forming the hemorrhoids, is the modern operation There are many minor differences in individual technique, but the main principles observed are ligation before excision, removal of only pathologic tissue, good hemostasis, and adequate drainage

Here again, the pre operative preparation of the patient, as mentioned above, and the employment of some type of non sleeping anesthetic, is the usual choice of the modern proctologist No longer is the hemorrhoidal patient confined to his bed for several days, on a liquid diet and his bowels prevented from moving On the contrary, he is up and around from the time he returns from surgery until he is discharged from the hospital, which is usually from three to five days in uncomplicated cases

Many cases of acute external thrombotic hemorrhoids, as well as simple single uncomplicated internal hemorrhoids, can be eradicated under local anesthesia in office practice In weak, debilitated persons hemophiliacs, or persons suffering from chronic diseases where surgery is contraindicated, or should be kept at a minimum, a form of sclerosing treatment under sterile precautions is employed A 5 to 10 per cent solution of phenol in a vegetable oil, or a 5 per cent aqueous solution of quinine and urea hydrochloride has proved very effective in office treatment The use of suppositories and ointments is of no avail whatsoever, excepting possible palliation, in the treatment of hemorrhoids

FISSURE IN ANO AND ANAL ULCER

The anal fissure is a traumatic condition, really a split through the anoderm, exposing sphincter fibers It is excruciatingly painful and is the result of trauma caused by coughing, sneezing or any unusual exertion and often by the passage of hard constipated stools Anal ulcers may follow trauma, but are usually the result of infection of the crypts of Morgagni mentioned above Formerly the treatment of these conditions was by forcible manual divulsion of the sphincter muscles, usually under general anesthesia, and often the bivalve speculum was employed In either case the sphincter muscles were always traumatized and, in some cases, incontinence occurred

The great advance made in the treatment of this simple but extremely painful condition is the incision at right angles to the direction of the sphincter fibers after the muscle has been thoroughly relaxed under the administration of local caudal or spinal anesthesia This wound, usually triangular or diamond shaped, is never sutured but is allowed to heal from within outward which it does in a very few days No drains of any kind are necessary and the patient is up and around immediately afterwards Unless the fissure or ulcer is a complication of other ano rectal disease the patient rarely has to be hospitalized

Fissures and ulcers may be single or multiple In the case of multiple fissures one incision is quite sufficient for the relief of all of the others In ulcers a separate incision is made through each ulcer One point to remember, as in all ano rectal surgery, is to carry each incision well out on to the skin for drainage

HEMORRHOIDS

In the minds of many laymen and a few physicians, the chief function of the proctologist is to treat hemorrhoids, or "piles" The disease of hemorrhoids was known and described as far back as biblical days, and is one of the commonest diseases which afflicts mankind Even seventy five years ago there had been little advance made in the palliative or in the surgical treatment of hemorrhoids Because some people thought that any rectal disease was an evidence of uncleanliness, they refrained from consulting their family physician from a sense of shame or false modesty As a result, many quacks, charlatans and imposters held themselves out to treat hemorrhoids and rectal diseases "without surgery or detention from business or one's ordinary occupation" It was really not until 1878 that reputable physicians began to realize that there was much to be desired in the treatment of the patient suffering from hemorrhoids In the early days there was no distinction made between internal and external hemorrhoids As a result of the employment of the so

called injection treatment, utilizing carbolic acid in various strengths, gangrene and infection frequently resulted from this method in external as well as in internal hemorrhoids

In the early surgical treatment of hemorrhoids general anesthetics, such as chloroform and ether, were employed The operation usually consisted of the amputation of the pile bearing area, unfortunately also frequently including portions of the sphincter muscles Another method was the use of a clamp and the burning off of these hemorrhoidal tumors with a red hot cautery Another method was the tying off of the internal hemorrhoids with non absorbable ligatures and either cutting the hemorrhoid away above the stump or, worse yet, allowing the hemorrhoids to necrose and the ligatures slough away Happily, the old "Whitehead operation" and the clamp and cautery have long since been discarded The infection, strictures and deformities and prolonged painful convalescence resulting from the use of these two methods were really a disgrace to the medical profession of those days

During the last half century, much progress has been made in rectal surgery and nowhere more than in the evolution of the operation of hemorrhoidectomy Today a hemorrhoid, which is a vascular tumor covered by either mucous membrane or skin, is treated the same as any other vascular tumor Incision or excision of excess mucous membrane or skin covering, excision of the pathological blood vessels and connective tissue forming the hemorrhoids is the modern operation There are many minor differences in individual technique, but the main principles observed are ligation before excision, removal of only pathologic tissue, good hemostasis, and adequate drainage

Here again, the pre operative preparation of the patient, as mentioned above, and the employment of some type of non sleeping anesthetic, is the usual choice of the modern proctologist No longer is the hemorrhoidal patient confined to his bed for several days, on a liquid diet and his bowels prevented from moving On the contrary, he is up and around from the time he returns from surgery until he is discharged from the hospital, which is usually from three to five days in uncomplicated cases

Many cases of acute external thrombotic hemorrhoids, as well as simple single uncomplicated internal hemorrhoids can be eradicated under local anesthesia in office practice In weak, debilitated persons, hemophiliacs, or persons suffering from chronic diseases where surgery is contraindicated, or should be kept at a minimum, a form of sclerosing treatment under sterile precautions is employed A 5 to 10 per cent solution of phenol in a vegetable oil, or a 5 per cent aqueous solution of quinine and urea hydrochloride has proved very effective in office treatment The use of suppositories and ointments is of no avail whatsoever, excepting possible palliation, in the treatment of hemorrhoids

PRURITUS ANI

No chapter, however, brief, on proctology would be complete without at least a reference to this distressing symptom which accompanies so many rectal, as well as systemic diseases The simplest definition of this condition is "an itching of the anus and perineum, which is worse after bowel movements and at bedtime, grows progressively worse and aggravated by scratching"

The exact etiology is still unknown and presents a fertile field for research As is well known, itching of the perineum, as well as other parts of the body, accompanies many systemic diseases Pruritus may be caused by, or accompany, any disease affecting the rectum and many affecting the vagina It may be caused by the irritation of abnormal discharges from the bowel It can be produced by allergy, parasites, fungi, bacteria, many medications and local irritants causing contact dermatitis Suffice it to say, that at the present time any or all of the therapeutic measures advocated for pruritus caused by any of the above irritants should be used in the individual case It has been found that in some old chronic cases of pruritus ani, an operation known as perianal neurotomy has been performed to give relief to a fair number of patients

OTHER DISEASES

There are many other proctologic diseases which should be discussed in a report on progress in the specialty in the last three quarters of a century, but even a mere mention of all of them would require too much space Much progress has been made in the treatment of congenital defects and anomalies, particularly since the employment of x ray in diagnosis Hirschsprung's disease, developmental defects such as imperforate anus and many other like diseases are being treated now in a much more successful and rational manner Prolapse of the rectum and intussusception are responding to better surgical methods

The diagnosis and treatment of proctologic conditions in infancy and children have made significant strides particularly in the last thirty years The recognition of comparatively minor conditions, which made many infants and children miserable and unhappy and problems to their parents and to their pediatricians, by proctologic examination and treatment, has resulted in relief of the symptoms, and, in many cases, made complete personality changes in these children

SUMMARY

or the
not in
much use are some of the proctologic diseases of the last three quarters
rhoids tury in which great progress in diagnosis and treatment has been
and extensany important diseases of the colon, rectum and anus, not men

tioned here, have been successfully treated because of the use of the modern methods of diagnosis and therapy which are standard in all specialties. With the establishment of the specialty of proctology on a sound scientific basis, as it is today, greater accomplishments will be expected in the next twenty-five years. It can be seen, however, that proctology has not lagged behind the other special fields of medicine; in fact, it is today one of the most progressive.

One fact which has contributed to the higher plane of successful medical treatment is the freedom and willingness with which all medical practitioners confer with one another, with the result that the patient of today is living longer, feeling better, and has greater future prospects than ever before.

LEO II BARTEMIFIER

~ 16 ~

PSYCHIATRY

By Leo H Bartemeier, M D

Associate Professor of Psychiatry, Wayne University College of Medicine, Detroit, Michigan, Visiting Professor of Psychiatry, University of Michigan Medical School, Ann Arbor, Michigan

IT HAS been said that World War II advanced the progress of psychiatry by two hundred years Whether or not this is true is of less importance than the probability that the great development and expansion of American psychiatry since 1945 is unparalleled in the history of medical psychology in this country The events during the war that initiated this progress are probably also unique in the history of medical science

The experiences of military psychiatrists in the various theaters of operations during World War II were the precipitating factors which brought about the rapid progress of psychiatry in the post-war era Before describing the experiences of psychiatrists during the war, it is necessary to draw a thumbnail sketch of events which had been taking place within the field of psychiatry for some twenty years previously During those years psychiatrists were divided over the theories and concepts of psychoanalysis The great majority whose orientation was more organic and less psychological found it difficult or impossible to accept the rather purely psychological orientation of the minority whose training in psychiatry had also included training in psychoanalysis Through the years from about 1920 onward, the development of psycho analysis took place slowly and steadily but the opposition to its accep tance by many psychiatrists persisted in somewhat the same manner as the sufferance which the majority of medical practitioners and medical teachers expressed toward psychiatry during the same period Then came the war

In the medical corps of the Army, the Navy, and the Air Force, psychi atrists and psychoanalysts were brought together and worked side by side in the care and the treatment of the mentally sick In these military situations they were not distinguished from each other as they had been in civilian life For the first time they functioned together in a common

cause. They came to understand each other and to learn from each other. Many a psychiatrist had ample opportunity to repeatedly observe that the psychoanalytic training of his colleagues had provided an orientation to the understanding and the treatment of the mentally sick which he did not possess. Through these close associations, many a psychiatrist learned more satisfactory ways of approaching the patients assigned to him and more effective methods of treating them. Through these experiences much of the previous opposition to psychoanalytic theory and technique disappeared and was replaced by admiration for this knowledge. It is equally important to record the fact that the military situations of World War II did not permit those medical officers who had had psychoanalytic training to carry out formal psychoanalytic therapy as had been their custom in their civilian situations. They were required to function as psychiatrists and in this capacity they utilized their psychoanalytic training and experience. Thus it was that psychoanalytically oriented psychiatry became well established and highly regarded during World War II.

In the various theaters of military operations, psychiatrists were also brought into close working relationship with their medical colleagues and for the first time collaborated with them in their daily professional responsibilities. Through these experiences many medical officers had their first opportunity to understand how psychiatrists functioned with their patients. They learned from each other and at the close of the war, the relationship of psychiatry and medicine had improved considerably.

With the cessation of hostilities in 1945, many psychiatrists returning to civilian life sought training in the several psychoanalytic institutes, and during the past eight years all of American psychiatry has become infiltrated with psychoanalytic theory. This fact is of the greatest possible significance for the progress of both psychiatry and medicine because it has enhanced the understanding of the mentally sick as well as the many patients whose physical complaints are psychologically determined. In addition to becoming an important specialty within the framework of medicine, psychiatry has become a basic science for the study of both children and adults in their interpersonal and group relations. Psychiatry has achieved this development by having utilized what psychoanalysis had learned about the structure and functioning of personality. The application of this knowledge to the rearing of children, to the methods of education, and to the large field of industrial relations, for example, presents numerous possibilities for preventive medicine and public health. What psychiatrists have already accomplished in these directions only marks the beginning of its practical usefulness for a more intelligent management of human affairs and for the conservation of human resources. For example, during the recent flood disaster in Holland, the Dutch Minister of Health asked his Director of the Division of Mental Health for the Netherlands whether there were any mental

health principles which should be put into effect for the benefit of people in the flooded areas He said there were two (1) The families living on the inundated land were farmers They should be moved to farming regions (2) Children should not be separated from their parents These regulations were then broadcast to the nation and the Dutch Government politely declined the invitations from the French the English and the Germans in West Germany who had offered to care for the children of Dutch families who had lost their homes in the floods When a member of the Executive Board of the World Federation for Mental Health went to Frankfort a short time later, he learned from the Minister of Health that the German people had interpreted the action of the Dutch Government to mean that they could not trust them to care for their children because of persistent unfriendly post war feelings The Minister of Health himself was surprised to learn that the Dutch families were keeping their children with them for mental health reasons This information was then broadcast throughout Germany, France and England

The recommendation of the Dutch psychiatrist that farming families be moved to farms was based on the findings of studies made during World War II and subsequently on the psychological effects of migration The recommendation regarding the children was based on extensive research which has shown that every child from the age of six months to three and one half years needs to remain in the continuing care of its mother or a mother figure for the preservation of its future mental health This research has shown that children who have suffered severe deprivations through separation from their mothers during this period in their development have subsequently become the affectionateless psychopaths who have contributed considerably to social disorder Practicing physicians need to consider this basic psychiatric principle when they are about to recommend hospitalization for sick children Whenever it is possible to bring the hospital facilities into the home for the treatment of children who have not reached the age of five it is more advisable to do so When hospitalization cannot be avoided the anxiety which children suffer through separation from their families can be lessened by permitting a member of the family to remain with the child as much as possible Visitors' rules need to be modified in all hospitals for the benefit of the total needs of children

No one can take the place of a young child's mother particularly when the child is sick The benefits of successful hospital treatment of acute illness in children are often diminished or outweighed altogether by the anxiety inflicted by separation Severe emotional traumata prior to the fifth year are regularly reflected in the mental health of adult life to the detriment of the individual, the family and the community These traumata can be avoided whenever the obstetrician the pediatrician, the family doctor and the hospital personnel will have developed an understanding of the emotional needs of children and the relation of these

cause They came to understand each other and to learn from each other Many a psychiatrist had ample opportunity to repeatedly observe that the psychoanalytic training of his colleagues had provided an orientation to the understanding and the treatment of the mentally sick which he did not possess Through these close associations, many a psychiatrist learned more satisfactory ways of approaching the patients assigned to him and more effective methods of treating them Through these experiences much of the previous opposition to psychoanalytic theory and technique disappeared and was replaced by admiration for this knowledge It is equally important to record the fact that the military situations of World War II did not permit those medical officers who had had psychoanalytic training to carry out formal psychoanalytic therapy as had been their custom in their civilian situations They were required to function as psychiatrists and in this capacity they utilized their psychoanalytic training and experience Thus it was that psychoanalytically oriented psychiatry became well established and highly regarded during World War II

In the various theaters of military operations, psychiatrists were also brought into close working relationship with their medical colleagues and for the first time collaborated with them in their daily professional responsibilities Through these experiences many medical officers had their first opportunity to understand how psychiatrists functioned with their patients They learned from each other and at the close of the war, the relationship of psychiatry and medicine had improved considerably

With the cessation of hostilities in 1945, many psychiatrists returning to civilian life sought training in the several psychoanalytic institutes, and during the past eight years all of American psychiatry has become infiltrated with psychoanalytic theory This fact is of the greatest possible significance for the progress of both psychiatry and medicine because it has enhanced the understanding of the mentally sick as well as the many patients whose physical complaints are psychologically determined In addition to becoming an important specialty within the framework of medicine, psychiatry has become a basic science for the study of both children and adults in their interpersonal and group relations Psychiatry has achieved this development by having utilized what psychoanalysis had learned about the structure and functioning of personality The application of this knowledge to the rearing of children, to the methods of education, and to the large field of industrial relations, for example, presents numerous possibilities for preventive medicine and public health What psychiatrists have already accomplished in these directions only marks the beginning of its practical usefulness for a more intelligent management of human affairs and for the conservation of human resources For example, during the recent flood disaster in Holland, the Dutch Minister of Health asked his Director of the Division of Mental Health for the Netherlands whether there were any mental

health principles which should be put into effect for the benefit of people in the flooded areas He said there were two (1) The families living on the inundated land were farmers They should be moved to farming regions (2) Children should not be separated from their parents These regulations were then broadcast to the nation and the Dutch Government politely declined the invitations from the French, the English and the Germans in West Germany who had offered to care for the children of Dutch families who had lost their homes in the floods When a member of the Executive Board of the World Federation for Mental Health went to Frankfort a short time later, he learned from the Minister of Health that the German people had interpreted the action of the Dutch Government to mean that they could not trust them to care for their children because of persistent unfriendly post war feelings The Minister of Health himself was surprised to learn that the Dutch families were keeping their children with them for mental health reasons This information was then broadcast throughout Germany, France and England

The recommendation of the Dutch psychiatrist that farming families be moved to farms was based on the findings of studies made during World War II and subsequently on the psychological effects of migration The recommendation regarding the children was based on extensive research which has shown that every child from the age of six months to three and one half years needs to remain in the continuing care of its mother or a mother figure for the preservation of its future mental health This research has shown that children who have suffered severe deprivations through separation from their mothers during this period in their development have subsequently become the affectionateless psychopaths who have contributed considerably to social disorder Practicing physicians need to consider this basic psychiatric principle when they are about to recommend hospitalization for sick children Whenever it is possible to bring the hospital facilities into the home for the treatment of children who have not reached the age of five, it is more advisable to do so When hospitalization cannot be avoided the anxiety which children suffer through separation from their families can be lessened by permitting a member of the family to remain with the child as much as possible Visitors' rules need to be modified in all hospitals for the benefit of the total needs of children

No one can take the place of a young child's mother particularly when the child is sick The benefits of successful hospital treatment of acute illness in children are often diminished or outweighed altogether by the anxiety inflicted by separation Severe emotional traumata prior to the fifth year are regularly reflected in the mental health of adult life to the detriment of the individual the family and the community These traumata can be avoided whenever the obstetrician the pediatrician the family doctor and the hospital personnel will have developed an understanding of the emotional needs of children and the relation of these

needs to their future health and well being This means that the medical treatment and care of sick children includes the management of problems which properly belong to preventive medicine

The utilization of psychiatric principles in the practice of medicine involves an orientation to patients which can best be acquired in the course of undergraduate medical education and residency training The teaching of these principles by psychiatrists throughout the four years in the medical schools, apart from the instruction in other subjects, is undoubtedly of much value in preparing future physicians for the practice of comprehensive medicine The optimum contribution of psychiatry to medical education cannot take place, however, until psychiatric principles become integrated into the teaching of each of the subjects that comprise the undergraduate curriculum How the gastro intestinal tract becomes involved, for example, in the unconscious effort to solve unconscious emotional conflicts, is a psychosomatic problem which can be taught far more effectively by the internist or the teachers in the department of surgery than by the lectures in the department of psychiatry Most of the professors of medicine and surgery at the present time have not been indoctrinated with this orientation which is relatively new even within the field of psychiatry itself It is probable, therefore, that the psycho physical social orientation to patients whose physical symptoms are the reflections of emotional disorders will wait to be taught by future medical educators who have acquired it during their own undergraduate training

The Group for the Advancement of Psychiatry has had the following to say on this subject "If medical treatment is to become comprehensive, the teaching of medicine, from its very beginning, should be kept as close as possible to the person, the total human being During his undergraduate years, the student should get an orientation of this sort which will last his lifetime To this end, he should see and study people from the first year on There are psychiatric implications in the care of every patient, and every fraction of clinical experience should be viewed with the broad generalization of dynamic psychiatry in mind The special function of the department of psychiatry in this connection is to give the student an understanding of the patient as a person, to give him some knowledge of the techniques necessary for relating himself to the patient so that he arrives at such an understanding, and to develop in him at least some minimum ability to use this knowledge consciously for the patient's benefit, whatever disease or disorder the patient may have"

The two lengthy conferences on psychiatry in medical education which were jointly sponsored by the Association of American Medical Colleges and the American Psychiatric Association in 1951 and 1952 are examples of collaboration between psychiatry and medicine which may prepare for the reorganization of medical education These conferences brought together deans of medical schools, professors of psychiatry and representatives of the American Medical Association in the field of medical

education The report of the first conference on Psychiatry in Medical Education has been published and the information regarding the second one will soon be available These meetings, of momentous significance for the progress of psychiatry, represent an effort to bring the standards of medical education into keeping with present day scientific knowledge regarding the psychological factors in illness which have become so prevalent in western civilization The acquisition of this knowledge during undergraduate medical education and residency training is es sential for its proper utilization in the practice of medicine To lecture about it to physicians whose medical training has been restricted to physical chemical bacteriological conceptions of illness and who have been in practice for several years, is far from satisfactory because lecturing is the least effective method for reorganizing attitudes toward people Opportunities for daily clinical presentations with as much participation by practicing physicians as by their teachers are as rare as the experiences of the psychiatrists and their medical colleagues during World War II

In his introductory chapter to the book entitled "Teaching Psycho therapeutic Medicine" Geddes Smith* wrote as follows "There has been growing uneasiness among thoughtful teachers of medicine about the fragmentation of medical knowledge and the failure of medicine, as com monly practiced, to deal helpfully with a very large group of very real troubles brought to the doctor by unhappy patients These are patients whom the physician has always with him but it took the war and its psychiatric casualties to spot their need The impetus for the particular experiment with which this volume is concerned came from a group of military and naval psychiatrists and medical educators who met at Hershey, Pennsylvania, in February 1945, under the auspices of The National Committee for Mental Hygiene and the Commonwealth Fund, to discuss the needs of veterans with psychoneurotic reactions This group agreed that care of such patients must be given primarily by general physicians, and recommended that a pilot course or courses, be set up at the postgraduate level to explore the possibilities of educating men in practice for this responsibility The Commonwealth Fund under took to provide such an experimental course and called into consultation, to plan it, a number of psychiatrists with relevant teaching experience After careful preparation the course was given in the first two weeks of April 1946 in cooperation with the Division of Postgraduate Education of the University of Minnesota

"This postgraduate course was an attempt, on a small scale to get the most pertinent parts of basic psychiatric thinking into general medicine It relied at bottom on three factors (1) the coherent presentation in simple terms of a few basic concepts (2) clinical practice under super vision, and (3) abundant discussion of a very informal kind For clinical teaching the University Hospital provided from its medical clinics pa

* Smith, Geddes Teaching Psychotherapeutic Medicine, courtesy of The Com monwealth Fund and Harvard University Press

tients with vague and often long standing physical complaints Dis cussion was encouraged by the formation of small teaching groups and was warmed by the friendly association of instructors and students, who lived together in the Center for Continuation Study, generously made available by the University

"The student group was selected by the Division of Postgraduate Education in such a way as to provide a representative sample of general medicine as practiced in Minnesota and the neighboring states Twenty three of the twenty five were general physicians or internists, most of the latter were in group practice One was a pediatrician, one a derma tologist Thirteen men were in their thirties, ten in their forties, two in their early fifties

'The teaching staff was drawn chiefly from the ranks of the younger psychiatrists most of them fresh from war service, who felt that psy- chiatry had something that could and must be shared with general medicine and recognized the urgent need of collaboration from general medicine in the care of the psychoneuroses Since only a short course seemed likely to set a pattern that could be generally followed and since it would be difficult to hold either students or instructors for longer than two weeks that period was adopted as a workable compromise Two weeks is a short time to reorient men in medicine

'Near the end of the course, the student physicians were asked to comment on it in writing What they wrote documented what they had been saying to each other and to the instructors Few said in so many words but many implied, that the course had given them a new outlook on medicine This was true especially at three interrelated points their attitude toward patients, their attitude toward the causes of disease, and their treatment of chronic illness More weight can be attached, perhaps, to what the same men had to say six months or more later, when seven teen answered new questionnaires about it, sixteen were seen in follow up visits by one of the instructors and a member of The Commonwealth Fund staff and fifteen attended a reunion or refresher course, a day and a half in length held at the University of Minnesota in December 1946 All told twenty three of the twenty five men were heard from in one or more of these ways The oldest man in the group, noting that 'the im pact of the course was the biggest event in twenty five years of profes sional life' gave this modest account of his experiences

'I take more time with my patients Formerly I did most of the talking Now I let them do it and it is so revealing—the stories that spout out that might bear on their illness An eighty nine year old woman told me yesterday, "You are the first doctor I've seen that isn't in a hurry to get me out of the office' In my own "bull in the china shop' method I believe my results in general are very good When a patient says 'Since I've talked with you my backache has disappeared My belly ache is gone I do not say they have been cured, but I say,

"If you know why you have this 'headache, or belly ache,' or what have you, then you are half cured and the other half may clear up in time" I have learned not to promise too much The patient usually understands and is satisfied Getting the patient half-well is comparatively easy But getting the last half well is my difficulty, which denotes lack of training I am trying to overcome this by more reading'

"Obviously no one in the group had become, or could have been expected to become, a skillful psychotherapist Some of them talked too much and listened too little, some tried to hurry their patients into insight, some felt at a loss in grappling with dimly seen difficulties They all worked near the surface of the patient's problems But this is where the general physician should work, and the patients they were helping at this level were precisely the patients whom they had previously been able to help very little or not at all They were thinking straight, also, about patients they could not help The doctor's own sense of frustration, and his irritation at the patients who frustrate him, have often tied his hands These men had stopped blaming patients for neurotic behavior, they had accepted the fact that a neurosis is real, not imaginary, and that a patient in pain or distress can be just as sick in the absence of physical findings as in their presence They had stopped blaming themselves for not being able, after due investigation, to pin the patient's troubles on an organic cause Freedom from these two common sources of constraint had made them better doctors They were happier in practice and therefore more helpful"

The pilot course in Psychotherapy in General Practice at the University of Minnesota in 1946 was unique in the history of medicine and psychiatry It is the protocol of an experiment in postgraduate medical education Similar courses of practical instruction might be established through the collaboration of state medical societies with university medical schools

Somewhat similar opportunities for practicing physicians to acquire a working knowledge of the psychiatric aspects of illness and practical methods for their treatment will become available when departments of psychiatry become established in general hospitals Psychiatrists will then have opportunity to make ward rounds with internists, surgeons, and all other practitioners of medicine The day to-day sharing of knowledge and exchange of ideas will be valuable for everyone concerned and will be equally applicable in the care of ambulatory patients These were the experiences which psychiatrists and their medical colleagues shared together in the military hospitals in World War II The general medical and surgical hospitals of the Veterans Administration regularly maintain departments of psychiatry and the general civilian hospitals can no longer afford to be without them if they are to provide adequate medical care for the treatment of the people in the communities who support them

Every physician practices psychiatry whether he knows it or not and psychotherapy begins when a patient comes to a physician for the first visit Every doctor knows that each patient reveals much information about himself of which he is unaware He does this in his speech, in his tone of voice, his posture, his gestures, his countenance, his attire, and in many other subtle ways This information is of value in learning to know the patient and how much or how little his personality is involved in his illness Every good physician utilizes this observable data in his study and his treatment of his patients What is frequently forgotten is that physicians also reveal much about themselves of which they are unaware to their patients To the extent that a physician can maintain as much awareness as possible of himself during his examinations and treatments of his patients, to this extent will he avoid the mistakes which interfere with his efforts to relieve their suffering

Many patients go to their physician for the first time with faith and confidence in his ability to help them They invest their doctor with the wisdom, the authority and the power they once attributed to their parents They seldom express these feelings but they often manifest them in their attitudes The physician has the highest obligation to maintain the confidence which his patients have in him in order that he may exert an optimum effectiveness in treating them

In seeking the advice of a physician every patient is as helpless and dependent as he was in his childhood when he turned to his mother for relief from his pain Every doctor patient relationship is a re enactment of the parent-child relationship The more aware a doctor can become of this fact the better will he understand and the more he will be able to help his patients

The good physician, like the good parent listens patiently remains calm and regards the patient with the same respect he would like to be shown were he in the place of the patient He does not permit the patient to ramble endlessly because a physician must conserve his time He does not hesitate to ask any questions which seem relevant In addition to the history of the present illness he attempts to learn what he can of the patient's social circumstances, particularly his relationships with his family He also wishes to know about the patient's work and his relationships in his industrial situation During the first visit of the patient the physician may do nothing more His first effort is to familiarize himself with the nature of the patient's illness how he lives with his family, how he feels about his work and how he gets along with others At this time the physician makes tentative appraisals of the patient s disposition, his intelligence, his attitude toward himself and his doctor It is as important to know what kind of person has an illness as it is to know what kind of illness a person has These are two facets of a whole which are inseparable The physician is not concerned whether an illness is organic or functional but to what extent it is organic and to what

In addition to the theoretical and technical advances which have characterized American psychiatry during recent years the hospital treatment of the mentally sick has become more effective for many patients, who in a former time, received nothing more than custodial care The utilization of the chemical and electrical therapies has hastened the recoveries of many patients incapacitated by acute psychotic illnesses In most instances the palliative nature of these therapies has arrested the acute phase of illness and has, at least temporarily, restored patients to their families and their occupations When it has been possible to do so, it has been recommended that these patients undertake psychotherapy in the hope of preventing further acute exacerbations of their illnesses

During the past few years, the establishment of training programs for attendants in mental hospitals in order to provide patients with more intelligent and more humane nursing care represents an important improvement in hospital services to the mentally sick These training programs have been provided by members of public mental hospital staffs and some twenty thousand of the eighty thousand attendants employed in state hospitals have completed two year programs of instruction Upon graduation they have achieved the status of psychiatric aides or psychiatric technicians The improvement of their morale, the increased satisfaction in their work and increases in their salaries have resulted in their remaining in their positions This is a factor of economic importance for hospital management as well as patient care, and is in sharp contrast to the previous rapid turnover of attendants

Following the example of medicine, psychiatry has become fragmented into a number of specialties and the American Psychiatric Association which has almost doubled its membership since 1945, has fifteen standing committees on the technical and community aspects of psychiatry There are those who devote themselves to child psychiatry, to public health, to industry to medical education, to research, to mental hygiene, to academic education to the armed forces and to other departments of government This does not include the large number of psychiatrists in private practice in hospitals and in clinics These developments, which are indicative of the progress of psychiatry, are each contributing to the larger problem of medical care The *great* progress in psychiatry, however, will not take place until the knowledge and techniques it has acquired become useful to every practicing physician This knowledge includes the personality of the physician as well as the personalities of his patients because the practice of medicine invariably includes the doctor patient relationship In many illnesses this relationship is as important for restoring patients to health as technical knowledge and skill which physicians ordinarily employ In some illnesses it is more important This fact is well known and is demonstrated in the everyday practice of medicine

Every physician practices psychiatry whether he knows it or not and psychotherapy begins when a patient comes to a physician for the first visit Every doctor knows that each patient reveals much information about himself of which he is unaware He does this in his speech, in his tone of voice, his posture, his gestures, his countenance, his attire, and in many other subtle ways This information is of value in learning to know the patient and how much or how little his personality is involved in his illness Every good physician utilizes this observable data in his study and his treatment of his patients What is frequently forgotten is that physicians also reveal much about themselves of which they are unaware to their patients To the extent that a physician can maintain as much awareness as possible of himself during his examinations and treatments of his patients, to this extent will he avoid the mistakes which interfere with his efforts to relieve their suffering

Many patients go to their physician for the first time with faith and confidence in his ability to help them They invest their doctor with the wisdom, the authority and the power they once attributed to their parents They seldom express these feelings but they often manifest them in their attitudes The physician has the highest obligation to maintain the confidence which his patients have in him in order that he may exert an optimum effectiveness in treating them

In seeking the advice of a physician every patient is as helpless and dependent as he was in his childhood when he turned to his mother for relief from his pain Every doctor patient relationship is a re enactment of the parent child relationship The more aware a doctor can become of this fact the better will he understand and the more he will be able to help his patients

The good physician, like the good parent listens patiently remains calm and regards the patient with the same respect he would like to be shown were he in the place of the patient He does not permit the patient to ramble endlessly because a physician must conserve his time He does not hesitate to ask any questions which seem relevant In addition to the history of the present illness he attempts to learn what he can of the patient's social circumstances particularly his relationships with his family He also wishes to know about the patient's work and his relationships in his industrial situation During the first visit of the patient the physician may do nothing more His first effort is to familiarize himself with the nature of the patient's illness how he lives with his family, how he feels about his work and how he gets along with others At this time the physician makes tentative appraisals of the patient s disposition, his intelligence, his attitude toward himself and his doctor It is as important to know what kind of person has an illness as it is to know what kind of illness a person has These are two facets of a whole which are inseparable The physician is not concerned whether an illness is organic or functional but to what extent it is organic and to what

extent it is functional This can only be determined through knowing the patient as well as his illness

At the conclusion of the first visit the physician avoids making any promises except the promise to see the patient again as soon as possible He wishes to learn more and he does not profess to know more than he does Throughout his treatment of his patient he is as honest as possible and never hesitates to acknowledge that he does not know or that he does not understand If the patient expresses his own opinion about the diagnosis or the treatment of his illness, the physician does not take umbrage because he is aware of the vast amount of medical information which is available to lay persons, and he remembers too how he was wont to diagnose his own symptoms during his years as a medical student In his relationship with his patient the doctor avoids talking about himself, his family, his friends and other physicians He avoids assuming an artificial attitude of authority or one of omniscience and he accepts any justifiable criticism of himself or his nurse which his patient may make He is never afraid of his patient Not being afraid, he does not need to yield to requests which his patient may make and with which he does not feel in accord His patient may express momentary resentment but will simultaneously experience renewed esteem and confidence in his physician

Whenever it is possible to do so, it is advisable that patients be seen by appointment and on time When they are required to wait for their physician in his reception room for long periods, they become resentful and correctly assume that he has no regard for the value of *their* time and is solely concerned with his own The physician will not accept more patients into his care than the number for whom he has ample time To accept more necessitates less time for each, more visits for each and less opportunity to render optimum professional care

The physician avoids making predictions about the length of the treatment and remains conservative about the benefits to be derived Some of the doubts or fears he may have about his patients may be due to his own anxieties rather than to anything his patient feels about him

SUMMARY

It is far more difficult to practice the basic concepts which have been outlined than it is to describe them They are, however, the psychiatric principles which need to be included in the daily practice of medicine Some of them are regularly practiced by physicians who have not had the benefit of any psychiatric indoctrination

ANDREW H DOWDY

STAFFORD L WARREN

~ 17 ~

RADIOLOGY

By Andrew H Dowdy, M D

Professor and Chairman, Department of Radiology, School of Medicine, University of California at Los Angeles, Los Angeles California

and

Stafford L Warren, M D

Professor and Chairmon, Department of Biophysics, School of Medicine, University of California at Los Angeles, Los Angeles California

A TREMENDOUS literature has developed concerning the details of techniques and procedures, new sources of energy enhanced or new biological effects and the like The authors intend merely to review these developments briefly in order to show the trends of usefulness in the clinical and allied fields in order that a proper perspective may be had of the usefulness of radiation in medicine For more precise and specific information, the reader is referred to the current literature where he can find a wealth of such information

Measured in terms of years of existence, Radiology is the junior member of all the medical sciences In November 1895 William Konrad Roentgen discovered *x* rays one year later Antoine Becquerel announced his discovery of natural radioactivity These two events rank in importance among the historic events of the world with the discovery of fire, electricity, nuclear fission and the production of man controlled nuclear energy

A more appropriate age for the discovery of *x* rays and natural radioactivity could not have been selected by design since the associated and allied disciplines in medicine were at the turning point in their development The basic principles of anatomy histology pathology bacteriology, physiology and biochemistry were established Anesthesia had revealed a new vista for surgery Medicine and all its branches soon rapidly passed from an art to a science Radiology has played a vital role to further augment and strengthen this transition

The diagnostic aspects of radiology were the first to be appreciated although these were soon followed by the therapeutic applications of

roentgen rays and radium Technical advances were rapid and within a comparatively few years Coolidge, in 1913, developed the vacuum tube Self rectifying generators were in operation in 1917 E O Lawerence invented the cyclotron in 1931, the Joliots discovered artificial radio activity in 1934, nuclear fission was observed by Fermi in 1935,* and in 1940 Kerst invented the betatron

Today the field of radiology has grown to embrace diagnostic radiology, therapeutic radiology, radiation physics, radioactive isotopes and radiation biology (Chart I)

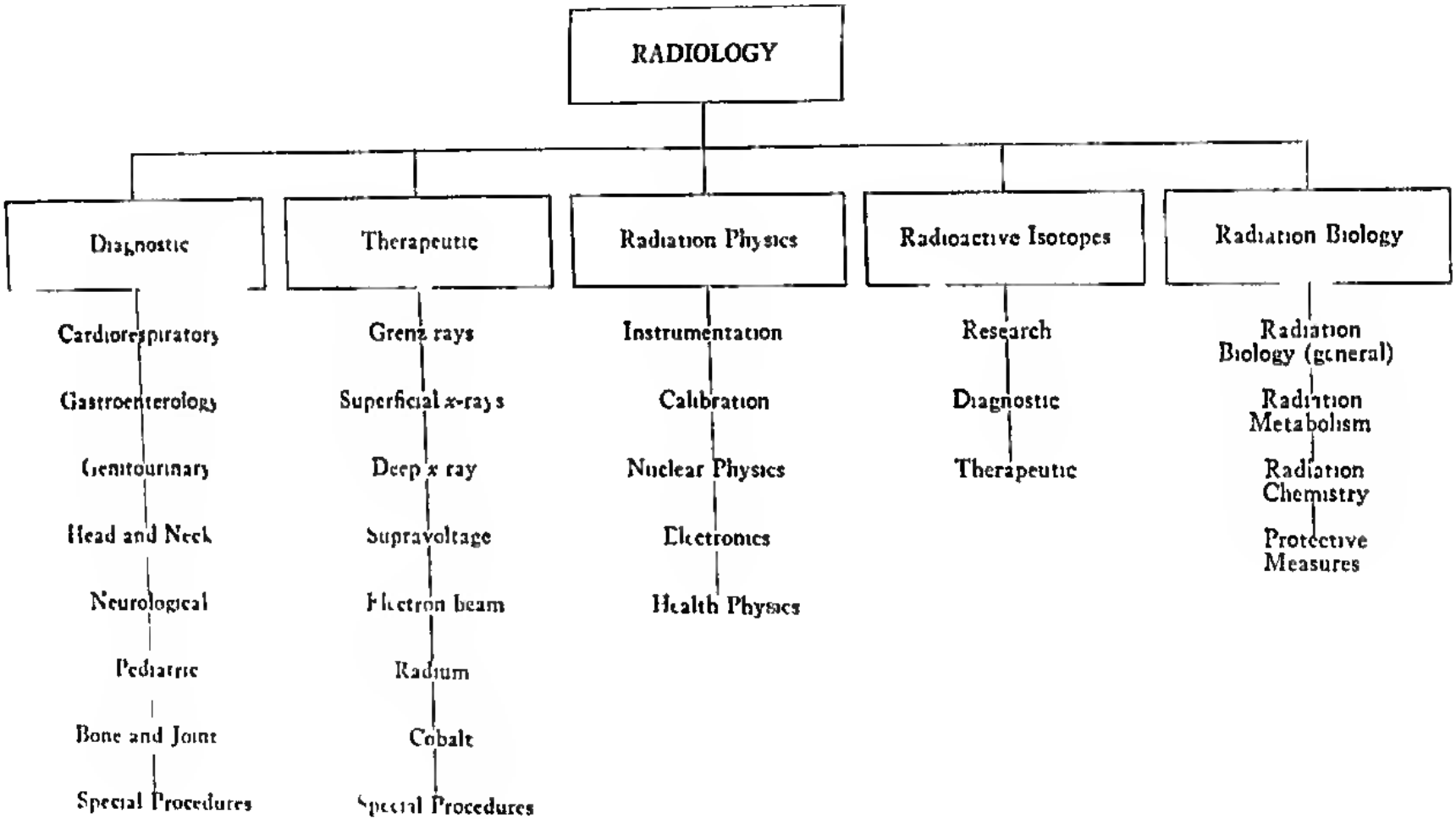
The success of radiology as a specialty depends upon a thorough knowl edge of the physical and biological aspects of ionizing radiations on the one hand and comprehension of the pathogenesis of disease upon the other Roentgen images upon a radiographic film constitute a symphony of contrasting shadows varying in density and degree which, if con sidered empirically or apart from the clinical aspects of disease, may result in a discordant note in the ultimate care of the patient The greatest advances in medicine have been made by those medical centers embracing this philosophy

DIAGNOSTIC RADIOLOGY

The earliest advances in this branch of radiology were mainly those of improvement in equipment The first diagnostic machines consisted in the main of a gas tube connected to a hand operated electrostatic gener ator Exposure times were prolonged, the x ray output was very erratic in both quality and quantity and depended upon the variable degree of vacuum which could be maintained within the tube Oftentimes the accumulation of gas within the tube became so great that x rays, if produced at all, were so 'soft as to be scarcely able to escape through the glass wall of the tube At best the emergent x ray beam produced was of such low intensity it was impossible to utilize exposure times sufficiently short in duration to stop the heart motion in chest radiography The accomplishment of the first chest radiograph taken in less than one tenth of a second was hailed as a notable achievement Present day equipment permits routine exposures in one sixtieth of a second with automatic control of the exposure time with photo timing The rotating anode tube has greatly extended tube life and with the small focal spot a more de tailed radiographic image is possible High voltage radiography, high intensity screens spot films fine grain film emulsion, improved fluor oscopic screens screen amplification, and automatic film processing have all been factors important in improving diagnostic facilities Diagnostic

* When Fermi first witnessed nuclear fission he was under the impression he had produced transuranium elements It remained for Hahn and Strassman in 1938 to demonstrate that uranium could be split They termed this splitting process fission

CHART I


RADIOLOGY
Diagnostic
Therapeutic
Radiation Physics
Radioactive Isotopes
Radiation Biology
Cardiorespiratory
Gastroenterology
Genitourinary
Head and Neck
Neurological
Pediatric
Bone and Joint
Special Procedures
Grenz rays
Superficial x-rays
Deep x ray
Supravoltage
Electron beam
Radium
Cobalt
Special Procedures
Instrumentation
Calibration
Nuclear Physics
Electronics
Health Physics
Research
Diagnostic
Therapeutic
Radiation Biology (general)
Radiation Metabolism
Radiation Chemistry
Protective Measures

x ray equipment today consists of machines which operate with the reliability and precision of a high grade watch

Concomitant with the improvement in equipment there has been a steady advancement in radiographic techniques and professional competence Improvements in detail of the fine bone structure and soft tissue have been mostly a result of improved equipment Better radiography of the chest and planigraphy may likewise be attributed to this same source

Planigraphy is a technique which permits a radiographic section to be visualized through any area at a desired depth within the body This is accomplished by the use of accessory equipment which moves the film in one direction parallel to the body during the film exposure while the radiographic tube describes an arc moving on an arm in a direction *opposite to that of the film The equipment is so adjusted that the pivot of motion of the film and of the x ray tube occur at a fixed point* at the predetermined depth to be visualized in the body The resultant radiograph reveals the structures well delineated in a plane through the pivotal point while the structures above and below this plane are blurred out as a result of the motion of the film and tube This procedure is valuable in detecting certain cavities within the lungs, for obtaining detailed views of the larynx paranasal sinuses, the temporomandibular joint and in certain bone lesions When combined with air as a contrast medium the technique may be extended to the study of abdominal, retroperitoneal and other structures

Roentgencinematography or "x Ray Movies"

This technique is sufficiently advanced in some medical centers to have become a valuable adjunct in the study of heart motion, the motion of joints and of the gastro intestinal tract Further improvement in lenses, cameras and screen intensification may ultimately result in widespread usage of this method of study

Contrast Media Studies

In order for organs and structures to be visualized radiographically on a fluoroscopic screen or an x ray film, there must be a differential in density between them and the surrounding structures Bones are readily detectable because of their dense structure in comparison to the surrounding muscle tissue The heart great vessels, and major pulmonary structures are dense in comparison to the adjacent air containing alveoli The subcutaneous fatty tissue is more radiolucent than the underlying muscular structures and with so called soft tissue radiography may be fairly well delineated

The contrast media in common use today include air, oxygen, barium sulfate, lipiodol, Pantopaque, and other iodized preparations such as

Neo Iopax Diodrast sodium iodide solutions and various excretory iodized compounds used in gall bladder or urinary studies

Thorotrast (thorium dioxide) has been used infrequently in the past to visualize the liver and spleen Its use today is frowned upon because of its several disadvantages It remains fixed permanently in the reticulo endothelial system of the liver and spleen and is mildly radioactive emitting alpha particles Perhaps an equally as great or greater dis advantage becomes evident should the material escape into the soft tissue at the time of injection where it becomes fixed at the site and produces an intensely painful local fibrosis

The use of the various contrast media if properly selected for the spe cific purpose makes it possible to visualize radiographically with more than a fair degree of accuracy most of the solid viscera all hollow viscera and the cardiovascular system

The introduction of barium preparations by mouth for the study of the upper gastro intestinal tract and the small bowel and the barium enema for visualization of the colon constitute relatively simple pro cedures which have undergone only minor modifications throughout the years since their introduction From time to time improvements have been made in barium preparations which permit the gastric rugal pattern to be revealed in greater detail More recent studies have been directed toward micronized barium enema preparations which cling to the mucosa of the colon better in the post evacuation states These latter prepara tions are of particular value when air is introduced into the lumen fol lowing the evacuation of the barium This procedure is termed double contrast and is of value in detecting polyps of the colon and mucosal lesions of relatively small size

Opaque media which are specifically concentrated and excreted are indispensable in the visualization of the gall bladder and the kidneys For visualization of the kidney pelves calices and ureters one may employ the excretory method or the opaque medium may be introduced directly into the kidneys by the retrograde catheter method The latter insures a more reliable visualization of the kidneys and ureter and under certain circumstances either supplements or supplants the excretory method Air or radiopaque materials may be injected directly into the urinary bladder for its visualization Each has its advantages although the radiopaque is in more general use

The injection of iodized oils (lipiodol) or other radiopaques into the trachea continues to be a satisfactory method for the visualization of the bronchial tree This is the only method whereby the radiographic diagnosis of bronchiectasis may be made with certainty Bronchial polyps stenoses and obstructions are likewise visualized by this method

Lipiodol or other radiopaques may be injected into the paranasal sinuses to detect polyps tumor growths and thickening mucous mem branes It is a valuable contrast medium for the radiographic visualiza

By the utilization of the appropriate precautions and methods of injection it is possible to visualize radiographically the biliary tree, portal circulation, aorta, vena cava, and the peripheral blood vessels "*Abdominal aortography*" is perhaps the most valuable procedure of this latter group although each has its particular application In abdominal aortography the iodized medium, usually Diodrast, may be introduced directly into the aorta with a needle via the lumbar area Urologists have found the technique invaluable in a study of the circulation of the kidney and adrenals where it is a valuable diagnostic aid in the detection of cysts, tumors and abnormal renal circulatory patterns

Air as a contrast medium has been utilized for many years in encephalography and ventriculography More recently air or oxygen in relatively large amounts has been introduced through the presacral tissues into the retroperitoneal space for better visualization of the adrenals, kidneys ureters and intra abdominal organs The procedures appear to be relatively safe and free from undue distress on the part of the patient if due care is taken in the choice of patient in the use of sterile precautions, and so on

The one organ for which one has the least satisfactory visualization by any of these methods is the pancreas However, with the aid of the various contrast media discussed and the properly standardized technique it is now possible to visualize radiographically practically all of the major organs and organ systems within the body

THERAPEUTIC RADIOLOGY

Therapeutic radiology depends upon the availability of a suitable and dependable source of radiation in order to be utilized to its fullest extent Many areas are still unexplored Improvements in mechanical and electrical equipment may be said to have occurred even more rapidly in the field of therapeutic radiology than in that of diagnostic radiology Present day facilities have a choice of standard equipment with voltage ranges from 10 volts (Grenz rays) to 250 kilovolts Supravoltage ranges run from 400 kilovolts to 1 million volts Multimillion volt therapy equipment is capable of producing x rays from 2 million volts to 50 million volts or higher The betatron will produce x rays at voltages of 100 million volts however, most of those constructed for medical purposes produce x rays or electrons in the neighborhood of 25 million volts

It is doubtful at this state of our knowledge whether x rays produced at high voltages will materially effect any very substantial improvement percentage wise in the cure of cancer The practicing radiologist should take this into account particularly in view of the greater cost of these high energy generators In general these increased voltages simply mean that the resultant x rays have a shorter wave length and are thus capable of penetrating more deeply into the body before the energy is absorbed

By the utilization of the appropriate precautions and methods of injection it is possible to visualize radiographically the biliary tree, portal circulation, aorta, vena cava, and the peripheral blood vessels "*Abdominal aortography*" is perhaps the most valuable procedure of this latter group although each has its particular application In abdominal aortography the iodized medium, usually Diodrast, may be introduced directly into the aorta with a needle via the lumbar area Urologists have found the technique invaluable in a study of the circulation of the kidney and adrenals where it is a valuable diagnostic aid in the detection of cysts, tumors and abnormal renal circulatory patterns

Air as a contrast medium has been utilized for many years in encephalography and ventriculography More recently air or oxygen in relatively large amounts has been introduced through the presacral tissues into the retroperitoneal space for better visualization of the adrenals, kidneys ureters and intra abdominal organs The procedures appear to be relatively safe and free from undue distress on the part of the patient if due care is taken in the choice of patient, in the use of sterile precautions and so on

The one organ for which one has the least satisfactory visualization by any of these methods is the pancreas However, with the aid of the various contrast media discussed and the properly standardized technique it is now possible to visualize radiographically practically all of the major organs and organ systems within the body

THERAPEUTIC RADIOLOGY

Therapeutic radiology depends upon the availability of a suitable and dependable source of radiation in order to be utilized to its fullest extent Many areas are still unexplored Improvements in mechanical and electrical equipment may be said to have occurred even more rapidly in the field of therapeutic radiology than in that of diagnostic radiology Present day facilities have a choice of standard equipment with voltage ranges from 10 volts (Grenz rays) to 250 kilovolts Supravoltage ranges run from 400 kilovolts to 1 million volts Multimillion volt therapy equipment is capable of producing x rays from 2 million volts to 50 million volts or higher The betatron will produce x rays at voltages of 100 million volts however, most of those constructed for medical purposes produce x rays or electrons in the neighborhood of 25 million volts

It is doubtful at this state of our knowledge whether x rays produced at high voltages will materially effect any very substantial improvement percentage wise in the cure of cancer The practicing radiologist should take this into account particularly in view of the greater cost of these high energy generators In general these increased voltages simply mean that the resultant x rays have a shorter wave length and are thus capable of penetrating more deeply into the body before the energy is absorbed

tion of sinus and/or fistulous tracts Lipiodol has one disadvantage in that it is non absorbable and must be removed at the time of injection or eliminated by gravity or the expulsive act of coughing when injected into the bronchial tree

Prior to the introduction of Pantopaque, lipiodol was commonly used in the spinal canal in routine myelography In such instances it was very difficult or impossible to remove Pantopaque, in addition to being moderately rapidly absorbed from the spinal canal, possesses physical properties which permit almost complete removal following the completion of the examination Both Pantopaque and lipiodol are quite satisfactory for use in uterosalpingography, for studies of the uterine cavity, in the detection of patency of the fallopian tubes and many others

Without doubt one of the most important uses of radiopaques in recent years has been the utilization of various water soluble iodinized compounds for the visualization of the cardiac chambers and of the vascular tree When the compound is introduced into a peripheral arm vein, it is termed *angiocardiography* ' This technique is of particular value in the diagnosis of the various congenital heart lesions which are amenable to surgical intervention It has contributed to the diagnosis of many other types of heart disease, atresias, aneurysms and pulmonary pathology By cardiac catheterization the opaque medium may be introduced directly into the respective cardiac chambers

Angiocardiography is not without its limitations and dangers both to the patient and to the operating personnel For best results specialized radiographic equipment is necessary which will permit the simultaneous exposure of films in the antero posterior and lateral projections of the heart and great vessels Much work in this field has been done with good results however utilizing less complicated and expensive equipment The minimum requirements necessitate facilities which will permit rapid exposures of serial films in order to obtain radiographs of the heart and great vessels during the phases of the cardiac cycle and visualization of the cardiac chambers and great vessels

The techniques involved in angiocardiography should be carried out by a well trained team fully aware of the possible dangers to the patient from the opaque material and from possible excessive radiation exposure This latter factor is likewise a potential danger to the physician injecting the dye' or radiopaque solution unless precautionary measures are carefully observed

Diodrast or other iodized water soluble media may be utilized to visualize the arteries and veins of the brain When used for this purpose the procedure is termed *cerebroangiography* It has been of great assistance in visualizing the normal arterial or venous circulation of the brain and in detecting the site and location of aneurysms brain tumors and cysts

By the utilization of the appropriate precautions and methods of injection it is possible to visualize radiographically the biliary tree, portal circulation, aorta, vena cava, and the peripheral blood vessels *"Abdominal aortography"* is perhaps the most valuable procedure of this latter group although each has its particular application In abdominal aortography the iodized medium, usually Diodrast, may be introduced directly into the aorta with a needle via the lumbar area Urologists have found the technique invaluable in a study of the circulation of the kidney and adrenals where it is a valuable diagnostic aid in the detection of cysts, tumors and abnormal renal circulatory patterns

Air as a contrast medium has been utilized for many years in encephalography and ventriculography More recently air or oxygen in relatively large amounts has been introduced through the presacral tissues into the retroperitoneal space for better visualization of the adrenals, kidneys, ureters and intra abdominal organs The procedures appear to be relatively safe and free from undue distress on the part of the patient if due care is taken in the choice of patient, in the use of sterile precautions, and so on

The one organ for which one has the least satisfactory visualization by any of these methods is the pancreas However, with the aid of the various contrast media discussed and the properly standardized technique it is now possible to visualize radiographically practically all of the major organs and organ systems within the body

THERAPEUTIC RADIOLOGY

Therapeutic radiology depends upon the availability of a suitable and dependable source of radiation in order to be utilized to its fullest extent Many areas are still unexplored Improvements in mechanical and electrical equipment may be said to have occurred even more rapidly in the field of therapeutic radiology than in that of diagnostic radiology Present day facilities have a choice of standard equipment with voltage ranges from 10 volts (Grenz rays) to 250 kilovolts Supravoltage ranges run from 400 kilovolts to 1 million volts Multimillion volt therapy equipment is capable of producing x rays from 2 million volts to 50 million volts or higher The betatron will produce x rays at voltages of 100 million volts however, most of those constructed for medical purposes produce x rays or electrons in the neighborhood of 25 million volts

It is doubtful at this state of our knowledge whether x rays produced at high voltages will materially effect any very substantial improvement percentage wise in the cure of cancer The practicing radiologist should take this into account particularly in view of the greater cost of these high energy generators In general, these increased voltages simply mean that the resultant x rays have a shorter wave length and are thus capable of penetrating more deeply into the body before the energy is absorbed

This property certainly has a considerable advantage over the *x* rays produced at lower voltages In the latter the *x* rays are absorbed in a higher degree in the superficial tissues and consequently an insufficient amount of the radiant energy penetrates to deep seated tumors in proportion to that which is absorbed in the superficial tissues

In contrast to our previous experience with the conventional high voltage equipment with the use of supra or multi voltage therapy, if properly applied the skin and superficial tissues are no longer the limiting factor relative to dosage Rather the deeply located normal tissue surrounding the cancer now becomes the limiting factor and the site where irreparable damage may be produced Insofar as *x* ray therapy in the larger medical centers is concerned, perhaps the most practical voltage for the treatment of deep seated tumors would be that produced with energy values in or near 4 million volts There are certain physical properties attributable to *x* rays produced with multivoltage *x* ray therapy equipment which are pertinent to a thorough consideration of this problem from the research point of view, but they are not apropos to the present discussion

Recently a great deal has been written and said about radioactive cobalt Co^{60} as a source of high energy radiation in deep therapy and as a substitute for radium Cobalt 60 is produced from Co^{59} in the pile by neutron bombardment It has a half life of 5 3 years This means that a given source of Co^{60} having as of today 100 per cent activity, will in 5 3 years have decayed to 50 per cent activity and in 5 3 more years will have been reduced to 25 per cent of its initial activity

The energy of its gamma rays* emitted is approximately equivalent to that of *x* rays produced at 2 million volts It can be expected then that the gamma rays from Co^{60} will produce the same biological effects as *x* rays produced at 2 million volts Likewise their biological effects and physical properties will be similar to the gamma rays of radium In order for cobalt to compete economically with 2 million volt *x* ray therapy or radium pack therapy the amount of cobalt used must be in the neighborhood of 1 000 to 1 200 curies Such amounts require expensive shielding and control devices just as the other sources do Perhaps cobalt in smaller amounts for interstitial and local therapy will become more competitive with like amounts of radium than it will as a source for deep therapy In certain specialized instances cobalt may have distinct advantages but in the main its ultimate value and importance as a therapeutic tool will have to be resolved on an economical and/or technical basis rather than on any unique biological property it may exhibit over supra voltage *x* rays or radium

* Gamma rays may be considered *x* rays which are produced within the nucleus of an atom and as such have the same physical and biological properties as *x* rays having equivalent energy

Perhaps the most significant advances in the radiation treatment of malignant disease have been those contributed by the radiation physicists and the radiation biologists The radiation physicists working in cooperation with the clinical radiologists have assisted materially in furthering the *science* of radiation therapy As a result of their endeavors, therapeutic radiology is passing from an era of empiricism to one of exactitude It is now possible to deliver a predetermined dose to remote tumors within the body There is a fairly clear conception of the *x* ray dose which is cancericidal to the various types of tumors Many years of clinical experience have taught us which normal structures will permit a cancericidal dose to cancer developing in the various tissues

Radiation physicists have been of the utmost value in arousing a new interest in *rotational therapy* Rotational therapy consists of either the rotation of the *x* ray beam around the central axis of the tumor or the rotation of the patient in such a manner that the *x* ray beam is constantly focused on the tumor This procedure permits the build up of high localized dosages within the tumor without undue radiation of the subcutaneous or surrounding normal structures in any one place

The authors would refrain from leaving the impression that radiation therapy will develop to the point where it will be the sole method used in the cure of all cancers Neither do we believe this is possible for surgery Both these modes of treatment are nonspecific and have many limitations, whether used singly or together They are the best we have for our time However, they are merely stop gaps until a more rational and specific type of therapy is developed When this latter becomes a reality, and we *feel certain* it is not too far distant, it will most likely be of a biochemical nature

RADIOACTIVE ISOTOPES

Radioactive isotopes constitute a comparatively new chapter in radiology and, as such, they have frequently been hailed as the means whereby all medical problems can and will be solved Important as isotopes are and will continue to become, this attitude can only be attributed to a well intentioned over-enthusiasm Their place in use today is of the following order of importance research tools, diagnostic aids, and therapeutic adjuncts

As research tools radioactive isotopes provide a technique which makes possible many research investigations of fundamental importance Their use does not necessarily simplify the problem for they have demonstrated how dynamic and constantly changing the living biological processes are Their availability is neither a substitute for the ingenuity of an idea nor the dexterity of its execution

The value of radioactive isotopes as an aid in diagnosis is perhaps best exemplified in the use of I^{131} in its application to thyroid function and

physiology The introduction of the scintillation counter and scanning and recording equipment has broadened this field Previous to the development of the scintillation counter it was necessary to use approximately 50 microcuries of I^{131} in conducting uptake studies of the thyroid It is now possible to obtain the same information routinely with 2 microcuries Scanning equipment for delineation of the thyroid, for calculation of its size in grams, and to note the presence or absence of hyperactive or non active nodules in the thyroid, requires the test dose of I^{131} to be considerably larger than for uptake studies and may amount to 75 to 100 microcuries These larger doses should not be employed unless it is anticipated that the patient will receive either surgery or therapeutic quantities of I^{131} upon completion of the studies

The treatment with I^{131} of hyperthyroidism in the non nodular thyroid seems likely to become the treatment of choice A very limited number of thyroid cancers which retain sufficient avidity for iodine may be suitably treated with I^{131}

The value as a diagnostic tool of radioactive iodine in the form of iodinated human albumen is evidenced in its use in detecting metastatic cancer of the liver, in the localization of brain tumors, and more recently in myelograms of the spinal canal Radioactive phospborus P^{32}, has been employed by numerous investigators in the detection and localization of numerous types of tumors

Phosphorus 32 has been used widely by various medical centers throughout the country in the treatment of leukemia and polycythemia vera More recently P^{32} in chromic phosphate and radioactive gold in colloidal form have been used for local interstitial injection or in the thoracic and abdominal cavities for palliative treatment of metastatic tumors

It may be said that the research and diagnostic utilization of the various radioactive isotopes will continue to expand rapidly Their therapeutic aspects will remain comparatively limited In certain areas they will serve as valuable adjuncts but they are not likely to achieve the prominence to be expected from their use in research and diagnosis Caution and conservatism are most important in regard to their therapeutic use lest they fall into disrepute as has the radium treatment of deafness in children The latter procedure, when used properly, is a valuable adjunct which is free of complications However, a lack of basic understanding of the time relationships of the biological actions of radiation on the part of the uninitiated has led to criticism of the procedure It is to be hoped the same fate may be avoided in the clinical applications of radioactive isotopes

Radiation biology is both the oldest and the newest member of the radiology family Many Europeans and Americans contributed significantly to our understanding of the biological actions of radiation It was not until the advent of the Manhattan Engineering District during World War II that any large scale endeavor was directed towards the

modus operandi of ionizing radiations. The endeavor has been continued and extended by the Atomic Energy Commission until it ranks in magnitude of support alongside cancer research.

A great deal is now known about the way in which radiation affects biological systems. The acute and chronic syndromes of radiation injury in mammals are quite well understood and documented in the current and voluminous literature. The exact mechanisms by which these syndromes are produced and the reparative mechanisms which compensate for the damage done by irradiation are, however, still not clear, but information in this regard is accumulating from all parts of the free world at an astounding rate. Many methods are now at hand which, when employed in pre-irradiation or post-irradiation to the laboratory animal, seem to alter or retard the acute post-irradiation changes. Less success has been attained in the alteration of the chronic changes. It is too early yet to say what may be used in humans to alter or alleviate the effects of exposure to lethal or sub-lethal amounts of total body irradiation. The radiologist, too, should always be aware during his own professional lifetime that any exposure to himself is fraught with accumulative dangers of insidious nature, and that leukemia has a higher incidence in his profession than it needs to have if he were to take the proper precautions. Shielding and techniques should be devised with this factor in mind, particularly since there is little doubt of the future great usefulness of these radiations and radioactive materials in a wide variety of ways.

SUMMARY

Radiology as a specialty may be said thus to be entering a new era in which all of its branches will develop rapidly in both diagnostic and therapeutic applications. The diagnostic facilities and techniques seem destined to achieve and maintain a high degree of competent performance. The advances in therapeutic radiology can be expected to keep pace with surgery in improving the care and treatment of cancer patients in those instances where it is the method of choice. Both surgery and radiation for a period will continue to be the best substitute until a more specific method is developed. It would be unwise to believe these methods can and will maintain this position indefinitely. A more rational treatment of cancer may be closer than we think.

ALFRED BLALOCK

ERIC M. NANSON

~ 18 ~

SURGERY

By Alfred Blalock, M D

Professor of Surgery and Director of the Department of Surgery, The Johns Hopkins University School of Medicine, Surgeon in Chief, The Johns Hopkins Hospital, Baltimore, Maryland

and

Eric M Nanson, M B , Ch B (N Z), F R C S (Eng)

Associate Professor of Surgery, The Johns Hopkins University School of Medicine, Baltimore, Maryland

A REVIEW of the history of surgery shows that there has never been such a period of progress and expansion as in the past seventy five years, 1878 to 1953 It is tempting to prophesy that in the future there will not be a similar such period, were that not foolish as is shown by the following quotation from Stephen Paget in 1896, who, speaking of cardiac surgery, said, "The surgery of the heart has probably reached the limits set by nature to all surgery, no new method and no new discovery can overcome the natural difficulties" How surprised he would be today if he could but see the many advances that have been made in that field

By 1878 the work of a number of men had made its imprint on surgery and widened its horizons tremendously Among these men were Pasteur, Koch and Lister Pasteur demonstrated the existence of bacteria that they were living organisms and that immunity could be built up against them In 1876, Koch published a paper on the anthrax bacillus showing for the first time that a definite infectious disease was caused by a specific micro-organism and in 1882 he announced his discovery of the tubercle bacillus From the work of these two men the fundamental science of bacteriology began Thus pus was no longer laudable but staphylococcal, puerperal sepsis was no longer childbed fever but streptococcal septicemia Joseph Lister, then a young Glasgow surgeon, was quick to appreciate the significance of Pasteur's and Koch's discoveries He evolved his system of antisepsis with the carbolic spray, the use of which spread rapidly, strangely enough more on the Continent than in England

so that in 1881 Volkmann delivered an address at the International Medical Congress in London on "Listerism and Its Influence on the Progress of the Surgeon"

One has but to consider that in the days before "Listerism" the mortality for amputation was 40 to 60 per cent and that this was due to infection and secondary hemorrhage, to understand the effect of the antiseptic principle in extending the scope of surgery But it must be remembered that Lawson Tait (1845–1899), the great Liverpool surgeon, had remarkably good results in ovariotomy by applying the principle of scrupulous cleanliness He steadfastly opposed Lister, and denied the existence of bacteria From Lister's antisepsis and Lawson Tait's cleanliness came the acceptance of asepsis, which is the cornerstone of surgical technique today In 1891, Halsted introduced the use of rubber gloves, initially, it must be admitted, to protect the skin of the hands of his scrub nurse It was later that the face mask was generally adopted It is of interest to compare an operating room of 1878 with that of 1953 and to see the development of asepsis, through which the healing of wounds by first intention has become the rule rather than the exception Consequently no region no organ, and no system of the human body is excluded from surgical intervention for fear of sepsis

Surgery has changed its aims and its nature over the past seventy five years Thus in 1878 and for some years after that, its aims were largely to extirpate diseased organs and to reconstruct trauma, with special accent on morbid pathology, whereas today there is more emphasis placed on preservation of function as well as the curing of the disease The operation for closure of a patent ductus arteriosus, first performed by Gross in 1938, is an excellent example of a physiological procedure whereby a congenitally abnormal child is converted into a physiologically normal one

The branching off of specialized fields from the parent general surgery is another feature of this period In 1878, practically all surgeons were general surgeons willing to perform and capable of performing any of the accepted surgical procedures of that day Their interests were wide, thus Jonathan Hutchinson (1828–1913) was a syphilologist, an ophthalmologist, and a general surgeon As the scope of surgery widened, however, it was beyond the abilities of one man to cover all fields, and so the specialties developed It is difficult to state exactly when a certain specialty began thus urology, as represented by perineal lithotomy and the treatment of urethral strictures, had been in existence for many years, but it was not until the latter half of the last century that it began to develop into the science we know today The same applies to gynecology Ophthalmology, however, is a much older specialty and the oculist dates from early Greek times, while it can be said that neurosurgery developed in the first twenty five years of the period under review, cardiac surgery has developed as a specialty in the last twelve years

Plastic surgery has, in many centers branched off from the parent stem in the thirty five years following World War I due to the work of such men as Gillies, Blair, Davis and Brown

Before the milestones of progress in surgery in the past seventy five years are reviewed it is important to examine the ancillary services which have made this progress possible and the first of these is anesthesia The use of ether as an anesthetic agent was demonstrated by Long in 1842 and by Morton in 1846 while in 1847 Simpson introduced chloroform These events proved not only a boon to the patient but also to the surgeon It meant relief of pain for the patient furthermore, it meant that the surgeon could depart from the habit of extremely rapid but inaccurate operating to adopt instead the slower painstaking anatomical technique as typified by Halsted in this country

The development of methods of maintaining ventilation of the lungs artificially during anesthesia has had far reaching effects especially in the field of thoracic surgery

The latest addition to the field of anesthesia has been the use of controlled hypotension This method has been of particular value to the neurosurgeon in dealing with highly vascular tumors such as meningiomas or acoustic neuroma tumors The hypotension is produced by either a controlled reduction of blood volume and later replacement or the use of the methonium group of drugs with suitable posturing of the patient

The effect of chemotherapy and the use of antibiotics on the surgery of the last twenty five years has been profound indeed in some respects it is comparable to that of antisepsis at the beginning of this seventy five year period

It is well to remember also the benefit that surgery has derived from the discovery of the roentgen ray

The development of blood transfusion has had a very great effect on surgery It appears that transfusion was first practiced in 1867 by Denys of Paris but the modern period begins in 1901 when Landsteiner and later Moss (1910) described the four blood groups thus making compatible blood transfusions possible The introduction of citrate as an anticoagulant was a great help to successful blood transfusion and enabled blood banks to be developed In 1911 Hustin used diluted citrated blood for transfusion and in 1915 Agote and Lewishon separately described transfusion by using citrated whole blood the latter described the technique in detail The work of Blalock in 1930 and of Parsons and Phemister in the same year brought about a better understanding of the pathogenesis of surgical shock and showed that blood replacement to restore blood volume was essential in its correction Since then blood transfusion to combat shock has proved its worth in all fields of surgery In World War II blood and plasma were given in large amounts even to casualties in the forward lines and undoubtedly played a large part in the improved recovery rate compared with that of World

War I In recent years various blood substitutes to combat shock, so called plasma expanders, have been developed Included among these are gelatin, dextran, developed by Groenwall and Ingelman of Sweden in 1941, pectin, globin and polyvinyl alcohol

The understanding of fluid replacement therapy in dehydration and electrolyte deficiency has been a great step forward, particularly in abdominal surgery The vital importance of water and salt depletion was appreciated by O'Shaughnessy and Latta in 1851 during the cholera epidemic of that year Exactly seventy five years ago the great French physiologist Claude Bernard, published his studies on body fluids and the constancy of *le milieu interieur* which has formed the basis of fluid balance as it is understood today In recent times, Peters, Coller, Marriott, Gamble, Hartmann, Darrow and others have advanced the knowledge of this important subject In this way patients who formerly would have died from peripheral circulatory failure, called "shock," are now recognized as having an electrolyte deficiency, and are rescued by appropriate intravenous therapy Of equal importance was the institution of gastro intestinal suction in 1932 by Wangensteen, further amplified by Miller and Abbott in 1934 with a balloon tipped tube, and later by Cantor with the mercury weighted tube The surgery of intestinal obstruction, of gastric lesions, and of the colon has made great progress over the last fifty years but over the past twenty that progress has been greatly accelerated by the recognition of the principle of intestinal decompression as typified by Wangensteen suction

Turning now to a review of surgery on a regional basis, we shall first consider surgery of the abdomen However, neurosurgery, gynecologic, orthopedic and thoracic surgery will not be discussed as each subject is covered in a separate chapter

ABDOMINAL SURGERY

Modern abdominal surgery began in 1809 when Ephraim McDowell of Kentucky performed the first ovariotomy with success, but celiotomy was a hazardous procedure before the advent of Lister, "and the peritoneum formed a barrier which the boldest surgeon hesitated to cross" However by 1880 Spencer Wells had published an account of his first 1000 cases of ovariotomy with a mortality of 4 per cent, and Lawson Tait of Liverpool recorded 139 consecutive cases without a death Both of these men insisted on the strictest cleanliness of instruments and hands although they did not subscribe to Listerism Then in 1886, Von Bergmann introduced steam sterilization, and by 1895 dry heat and steam were the accepted methods of sterilization so that by then the peritoneum could be opened with reasonable assurance

The surgical treatment of acute appendicitis was developed in the latter part of the last century This work might be considered as the wedge

which opened the door to the peritoneal cavity It began with the classical pathological identification of the disease by Reginald Fitz of Boston in 1886 Kronlein in 1884 had removed an appendix in a case of diffuse peritonitis In 1886, R J Hall was the first to remove an inflamed appendix, and in 1887, T G Morton made the diagnosis of acute appendicitis and performed an elective appendectomy For the next twenty five years the evolution of the story of acute appendicitis is recorded in a wealth of articles in the literature The mortality rate has dropped by early operation, and the mortality from peritonitis due to the disease has been further reduced by the intelligent use of intestinal suction intravenous fluids, and antibiotics But the present status cannot be viewed with equanimity There are still many deaths from appendicitis for example, in Great Britain some 1500 people die per annum from this disease

The leaders in the field of abdominal surgery at the end of the last century were undoubtedly the Germans, headed by Billroth of Vienna and his pupils, Czerny, Gussenbauer, Von Eiselsberg and others In 1881, Billroth resected the pyloric portion of the stomach for neoplasm, and by 1891 he had done 41 such resections with 16 deaths In 1882 Loreta performed the first pyloroplasty, and in 1902 J M T Finney described his pyloroplasty for pyloric stenosis Meanwhile Wolfers had invented gastro enterostomy, which was first performed in America by Ransohoff in 1884, and, in 1897, Schlatter reported the first total gastrectomy In 1885, Hacker described posterior gastro enterostomy Until this time a perforated peptic ulcer had not been treated successfully by surgery From 1884 to 1890 Mikulicz, Czerny Stelzer and Wahl all made unsuccessful attempts to close such a perforation However in 1892, Heusner of Barmen was successful in suturing a perforated gastric ulcer situated 3 centimeters from the cardia In the first twenty five years of this century, gastro-enterostomy was the accepted treatment for peptic ulceration, so that W J Mayo in 1912 was able to report 307 cases with 19 deaths In England, Sir James Walton and Lord Moynihan were in the forefront of this field, the latter having introduced intestinal clamps as an aid to bowel anastomosis in 1903 But from 1925 onwards due to the work of such men as Balfour, Finsterer, Hofmeister and Ogilvie, partial gastrectomy of the Polya type began to supplant gastro enterostomy in the treatment of peptic ulceration, with a mortality rate now of better than 2 per cent in experienced hands At the present time peptic ulcers are treated by gastrectomy with gastrojejunal or gastro duodenal anastomosis, or by gastro-enterostomy combined with vagotomy as advocated by Dragstedt in 1944

The surgery of cancer of the stomach has made little progress since Billroth's first case of successful excision A few cures are reported but distressingly few Total gastrectomy is now a practical proposition with a mortality in the region of 10 per cent in the hands of such men as

Lahey, Longmire and Marshall Carcinoma of the cardia is now amenable to excision largely due to the work of such men as Garlock, Sweet, Allison, and Tanner, who have popularized the thoraco abdominal incision over the last ten years

Although not an abdominal organ, the esophagus* will be considered in this section as a part of the gastro intestinal tract In 1872 Billroth did the first esophagectomy Forty one years later Franz Torek successfully removed a cancer of the esophagus, bridging the defect with a rubber prosthesis which the patient carried in his pocket This patient survived thirteen years During the 1920's, Grey Turner continued the attack using an antethoracic esophagus made from a skin tube Yudin dealt with esophageal stricture due to lye burns by creating a jejunal antethoracic esophagus Then in 1938, Adams and Phemister did the first successful esophagogastrostomy for cancer Since then esophagectomy and esophagogastrectomy have become standard operations, the continuity being restored either by esophagojejunostomy or esophagogastrostomy Although many others had done multiple stage procedure Cameron Haight of Ann Arbor did the first successful one stage repair of esophagotracheal fistula in 1941, using an extrapleural approach Of recent years hiatal hernia has become recognized as a surgical entity, and its repair with a large measure of success, has been described by Harrington Allison Sweet Belsey and others

In 1910 Fredet and in 1912 Ramstedt described their simple operation for congenital hypertrophic pyloric stenosis Previous to this unsuccessful medical treatment was persisted in, or gastro enterostomy was performed with a high mortality The surgical treatment of this condition by the Fredet Ramstedt operation has now reached such a pitch of perfection due to careful preoperative rehydration of the baby and a sensible postoperative feeding regimen, that many large series of consecutive cases have been reported without a death

During the first twenty five years of this period the development of intestinal resection and anastomosis in conditions such as strangulated hernia made great progress due to the work of such men as Payr, Lembert Mikulicz, Kocher Halsted and Connell Various ingenious devices such as the Murphy button catgut rings and the absorbable bone bobbin were used to facilitate bowel anastomosis In 1887, however Halsted reported his method of bowel suture, and this paved the way for the confident bowel anastomosis carried out today Previous to this the mortality of bowel resection had been appalling, Lockwood in 1891 recorded 40 cases of strangulated hernia with only 4 recoveries

During this period resection of the colon has undergone a remarkable evolution In 1903 Paul of Liverpool and Mikulicz of Breslau described the extraperitoneal resection of the colon for carcinoma This method

* Surgery of the esophagus is also considered in Chapter 19, p 259

held sway for over twenty five years and was very safe from the point of view of preventing peritonitis from a leaking suture line but it was not a good operation from the point of view of radical surgery for the cure of cancer because it did not permit an adequate removal of the glandular field Accordingly a proximal decompressing enterostomy of the type described by Devine was introduced and a subsequent intraperitoneal resection and anastomosis was performed to be followed by a third stage closure of the colostomy With the advent of the non absorbable sulfa drugs—sulfaguanidine sulfasuxidine and sulfaphthalidine in that order—it was possible to reduce the bacterial content of the large bowel very considerably so that one stage resection and an anastomosis became possible without proximal colostomy In the last few years this method has been aided by the use of the Miller Abbott and Cantor type tubes for intestinal decompression and streptomycin and now neomycin have supplemented the sulfa drugs Before the introduction of the chemotherapeutic agents aseptic large bowel anastomosis was advocated by Halsted and later Frazer, Dott Scanlon Rankin and others and there are some who continue to use it today for colonic surgery For the most part however, it has been superseded by the open method

The modern surgery of the rectum began in 1878 when Von Volkmann of Leipzig first excised a rectal carcinoma In 1883 Czerny carried out a combined abdominal and perineal excision of the rectum which he had not actually planned The first deliberate abdominoperineal excision of the rectum was carried out by Maunsell in 1894 For some time a two stage procedure was used in which a preliminary colostomy was done followed by abdominoperineal excision Then in 1908 Miles of London described the upward and lateral spread of carcinoma of the rectum and developed the one stage abdominoperineal excision which is the accepted operation today In Great Britain this has now been largely superseded by the synchronous combined excision of the rectum described by Lloyd Davis and Naughton Morgan in which two surgeons work at the same time one in the abdomen and the other in the perineum Numerous types of conservative resections of the rectum are performed whereby the sphincter mechanism is preserved Cuthbert Dukes has done much to elucidate the surgical pathology of rectal cancer by his careful work at St Mark s Hospital London

One of the most remarkable advances in abdominal surgery is the treatment of Hirschsprung s disease In 1947 Sweenson showed that the gross dilatation of the colon was really an obstructive phenomenon due to agenesis of the ganglia in Auerbach s plexus of the rectum which was for that reason an inert tube He therefore logically devised the operation of rectosigmoidectomy which has achieved remarkable success in this con dition by removing this inert segment

Advances in the surgical treatment of inguinal and femoral hernia have been made in the last seventy five years Up until 1890 there was

no such operation as the radical cure of an inguinal hernia; but in that year Bassini of Padua and Halsted of Baltimore described their respective operations for cure. Bassini's operation, or some modification of it such as the McVay procedure whereby the conjoined tendon is sutured to the iliopectineal ligament, is the most widely practiced today; the results are reasonably satisfactory. But there is no one procedure which is entirely satisfactory, as evidenced by the multiplicity of operations which are recommended. Over the last fifty years repair has been made by the use of fascial strips (Gallie), floss silk darn (Maingot), steel wire darn, nylon darn, tantalum mesh, silver filigree, dermis graft, and various relaxing incisions; by such means an effort is made to interpose a solid barrier against recurrence. For femoral hernia the Lotheisen (1908) repair is generally used, but the older operation from below still has a definite place.

In surgery for cure of cancer the most important development was the recognition of the necessity of removing the local lesion in its entirety, together with the lymph node field to which it drains, as an *en bloc* procedure. Cancer of the breast is a typical example. In 1894, Halsted reported his radical operation for cancer of the breast, which in essence is the operation used today. In 1909, he recorded a 35.9 per cent three-year cure rate following his radical procedure, and, in 1947, Gordon-Taylor claimed an 85 per cent five-year cure rate for Stage I breast cancer. Previous to 1894 many surgeons stated that they had never cured a cancer of the breast. The idea of radicalism in cancer surgery has spread so widely that now Brunschwig performs pelvic evisceration for extensive carcinoma in the pelvis, by which the whole pelvic contents are cleared out and the patient is given a *wet* colostomy.

ENDOCRINE GLANDS

Until 1872, the extirpation of goiter had been attended with disappointment and despondency due to the inability of the surgeon to control hemorrhage at the time of operation, with subsequent sepsis. But in 1872, Theodor Kocher of Berne proceeded to develop surgery of the thyroid gland with remarkable success. In 1883, he recorded 100 thyroidectomies with 12.8 per cent mortality. At this stage he used a vertical incision. By 1895, he had performed thyroidectomy 1000 times. In 900 cases of non-malignant and non-toxic goiter his mortality rate was 1 per cent. By this time he was employing partial thyroidectomy through a collar incision and had overcome the danger of myxedema. In America, Halsted described his method of thyroidectomy following his visits to Kocher's Clinic, and it is the method largely used today. In England, Berry, Dunhill and Joll were renowned for their success with thyroid surgery, especially in thyrotoxicosis, and in this country Charles Mayo, Lahey, Pemberton, Coller and others have had a wide experience. The

introduction of Lugol's iodine in 1923 by Plummer in the preoperative preparation greatly reduced the hazard of operating in cases of thyrotoxicosis Then in 1944, Astwood introduced the use of thiouracil which makes it possible to convert all toxic goiters to a non toxic state before operation As a result of all these great advances the mortality rate for thyroidectomy is now under 1 per cent

The surgery of the other endocrine glands presents a fascinating story In 1880, Sandstrom described the parathyroid glands, and Sly in 1891 showed that they were essential to life Von Eiselsberg showed their relationship to tetany, and MacCallum and Voegtlin proved their control over calcium metabolism in 1908 In 1926 Collip isolated parathormone In the same year Mandl excised a parathyroid tumor and relieved the condition of osteitis fibrosa cystica Churchill and Cope have recorded a series of cases treated successfully by operation

A similar type of evolution applies to the surgery of the islets of Langerhans In 1920, Banting and Best of Toronto isolated insulin in 1924, Harris described hyperinsulinism and in 1929 Roscoe Graham performed the first successful removal of an islet cell tumor thereby curing the patient of what was previously an incurable disease Whipple and others have reported a number of successful cases

In the case of adrenal gland dysfunctions, the cortex and the medulla have to be considered separately In 1927 C H Mayo was successful in removing a pheochromocytoma, although the significance of the tumor was not then appreciated, however, in 1929 Pincoffs and Shipley made a correct preoperative diagnosis and followed this by a successful excision Since then several reports of successful removal of these tumors have been made, notably those of Smithwick Walters and Cahill Up to 1944, 37 tumors had been removed with 24 survivals

Tumors of the adrenal cortex have been specially studied by Broster in England and Walters in this country In 1905 Bulloch and Sequeira recorded 11 cases of adrenogenital syndrome with virilism in the female In the prepuberty period these tumors were found to be malignant in most instances In later life adrenal hyperplasia might be the cause The tumors have been excised with relief of symptoms and in hyperplasia, total adrenalectomy on one side with a seven-eighths removal on the other has been successful in some patients Recently Huggins has advocated total adrenalectomy with substitution therapy for extensive metastatic carcinoma of the prostate gland and breast Zintel and others have performed total and subtotal adrenalectomy for severe intractable hypertension The ultimate value of these procedures has still to be proven

The surgery of the master endocrine gland itself the pituitary gland was the special field of interest of Harvey Cushing In 1912, he excised the pituitary of a dog and produced the adiposogenital syndrome and

from this time onward he elaborated and perfected the trans sphenoid approach to this gland in man, and wrote extensively on its pathology

GENITO URINARY SURGERY

Up until 1878, genito urinary surgery was largely concerned with calculus of the bladder and urethral stricture Lateral perineal lithotomy had been the operation of choice for bladder stone, but in 1883 Bigelow perfected his lithotrite and evacuator, which are in use today, for the removal of suitable bladder stones, furthermore, suprapubic cystotomy is now a safe procedure for removal of bladder calculus With the use of roentgen rays, renal surgery developed rapidly In 1896, Chapius and Chauvel detected a renal calculus by this means The first nephrectomy is reported to have been done by Gustav Simon of Heidelberg, and by 1890 over 100 cases were recorded but the results were disheartening Then in 1885, Nitze developed the cystoscope In 1893, James Brown catheterized a ureter in the female through an air cystoscope In 1895, Casper devised a catheterizing cystoscope which could be used in male patients and Albarran in 1897 added the elevating mechanism Mean while in 1918 potassium and sodium iodide were introduced as opacifying agents in retrograde pyelography, and Swick and Von Lichtenberg de veloped uroselectan for intravenous pyelography All these diagnostic aids were vitally important in the development of urological surgery, and have rendered the diagnoses in this field among the most scientifically accurate of all the branches of surgery

The surgery of the prostate gland began in 1880 when Dittel excised a median lobe Goodfellow proposed the perineal route In 1891, Belfield wrote an excellent account of prostatectomy for senile hyper trophy and stated that about 150 cases were on record In England, Freyer popularized the suprapubic transvesical enucleation, to which his name has become attached In America, H H Young developed the perineal excision both for benign hypertrophy and for radical cure of carcinoma of the prostate Transurethral prostatic resection has de veloped along two lines In 1909, Young devised a cold punch, which was improved by Braasch in 1918 and Bumpus in 1926 Further modi-fication was made by Gershom Thompson In 1912, Young devised a cautery resecting loop heated by electricity In 1920, Caulk extended its use, then Stern developed the high frequency current and made the resectoscope using the McCarthy foreoblique telescope In 1944, Millin revived interest in the retropubic approach to the prostate, which had been first proposed in Holland, and this gained much favor in England Thus at the present time there are at least four routes available for prostatic removal

The operation of ureterosigmoidostomy is now a frequent procedure in such conditions as extrophy of the bladder, intractable tuberculous

cystitis, vesical malignancy, and Hunner's ulcer The first successful ureteric transplant was by Chaput in 1896 In 1913, Coffey described his submucosal implant method, and since then numerous modifications have been developed Stiles, Mayo, Grey, Turner and Nesbit have been specially interested in this work Since the last chapter of this book deals with urology, we have mentioned only certain highlights of surgical interest in this seventy five year period

SURGERY OF THE HEART AND GREAT VESSELS*

The surgery of the heart and great vessels is the youngest of all the specialties Its recent evolution is quite staggering It is important to pay tribute to the work of Alexis Carrel who in 1908 demonstrated a satisfactory method of blood vessel anastomosis by use of an everting suture In 1938, Gross ligated the first patent ductus arteriosus In 1944, Blalock and Taussig performed the first subclavian to pulmonary artery anastomosis for tetralogy of Fallot In the same year, Crafoord resected the first coarctation of the aorta Since that time the surgery of congenital heart disease has extended widely Potts reported aortic pulmonary anastomosis in 1946, and in 1948 Brock described pulmonary valvulotomy for pulmonic stenosis and excision of the infundibular stenosis for tetralogy of Fallot Therefore, at the present time patent ductus arteriosus, tetralogy of Fallot, pulmonic stenosis, tricuspid atresia, coarctation of the aorta, and malformations of the aortic arch are all amenable to surgery Most recent of all, several surgeons have reported closure of interauricular septal defects Various workers are developing an extracorporeal pump to by pass the heart, so that cardiac surgery may be carried out in a bloodless field This would make possible, in the foreseeable future, the successful correction of transposition of the great vessels and of interventricular septal defects

In the field of acquired heart disease the most notable achievement has been the correction of mitral stenosis In 1926, Souttar dilated a stenosed mitral valve with his finger, using the same route through the auricular appendix that is used today But, strangely enough, the procedure was not repeated until 1947 when Bailey, Harken, Brock, Smithy and others began operating on the mitral valve with success At the present time an operation for mitral stenosis is a widely used procedure, giving relief to many hundreds of cardiac cripples The surgical cure of aortic stenosis has been successful in an increasing number of cases Beck is endeavoring to revascularize the heart in coronary ischemia Saccular aneurysms of the aorta have been successfully excised by Cooley, DeBakey and Bahnson Previous to this they had been treated by wiring, steel wire or insulated wire with electric coagulation being used Blakemore, using electric coagulation technique, has been successful in treating fusiform

* This interesting specialty is also considered in Chapter 19, p 261

from this time onward he elaborated and perfected the trans sphenoid approach to this gland in man, and wrote extensively on its pathology

GENITO URINARY SURGERY

Up until 1878, genito urinary surgery was largely concerned with calculus of the bladder and urethral stricture Lateral perineal lithotomy had been the operation of choice for bladder stone, but in 1883 Bigelow perfected his lithotrite and evacuator, which are in use today, for the removal of suitable bladder stones, furthermore, suprapubic cystotomy is now a safe procedure for removal of bladder calculus With the use of roentgen rays, renal surgery developed rapidly In 1896, Chapius and Chauvel detected a renal calculus by this means The first nephrectomy is reported to have been done by Gustav Simon of Heidelberg, and by 1890 over 100 cases were recorded but the results were disheartening Then in 1885 Nitze developed the cystoscope In 1893, James Brown catheterized a ureter in the female through an air cystoscope In 1895, Casper devised a catheterizing cystoscope which could be used in male patients, and Albarran in 1897 added the elevating mechanism Meanwhile in 1918 potassium and sodium iodide were introduced as opacifying agents in retrograde pyelography, and Swick and Von Lichtenberg developed uroselectan for intravenous pyelography All these diagnostic aids were vitally important in the development of urological surgery, and have rendered the diagnoses in this field among the most scientifically accurate of all the branches of surgery

The surgery of the prostate gland began in 1880 when Dittel excised a median lobe Goodfellow proposed the perineal route In 1891, Belfield wrote an excellent account of prostatectomy for senile hypertrophy and stated that about 150 cases were on record In England, Freyer popularized the suprapubic transvesical enucleation, to which his name has become attached In America, H H Young developed the perineal excision, both for benign hypertrophy and for radical cure of carcinoma of the prostate Transurethral prostatic resection has developed along two lines In 1909, Young devised a cold punch, which was improved by Braasch in 1918 and Bumpus in 1926 Further modification was made by Gershom Thompson In 1912, Young devised a cautery resecting loop heated by electricity In 1920 Caulk extended its use, then Stern developed the high frequency current and made the resectoscope, using the McCarthy foreoblique telescope In 1944, Millin revived interest in the retropubic approach to the prostate, which had been first proposed in Holland, and this gained much favor in England Thus at the present time there are at least four routes available for prostatic removal

The operation of ureterosigmoidostomy is now a frequent procedure in such conditions as extrophy of the bladder intractable tuberculous

cystitis, vesical malignancy, and Hunner's ulcer. The first successful ureteric transplant was by Chaput in 1896. In 1913 Coffey described his submucosal implant method and since then numerous modifications have been developed. Stiles, Mayo Grey Turner and Nesbit have been specially interested in this work. Since the last chapter of this book deals with urology, we have mentioned only certain highlights of surgical interest in this seventy five year period.

SURGERY OF THE HEART AND GREAT VESSELS*

The surgery of the heart and great vessels is the youngest of all the specialties. Its recent evolution is quite staggering. It is important to pay tribute to the work of Alexis Carrel who in 1908 demonstrated a satisfactory method of blood vessel anastomosis by use of an everting suture. In 1938, Gross ligated the first patent ductus arteriosus. In 1944 Blalock and Taussig performed the first subclavian to pulmonary artery anastomosis for tetralogy of Fallot. In the same year Crafoord resected the first coarctation of the aorta. Since that time the surgery of congenital heart disease has extended widely. Potts reported aortic pulmonary anastomosis in 1946 and in 1948 Brock described pulmonary valvulotomy for pulmonic stenosis and excision of the infundibular stenosis for tetralogy of Fallot. Therefore at the present time patent ductus arteriosus, tetralogy of Fallot, pulmonic stenosis, tricuspid atresia, coaretation of the aorta, and malformations of the aortic arch are all amenable to surgery. Most recent of all several surgeons have reported closure of interauricular septal defects. Various workers are developing an extracorporeal pump to by pass the heart so that cardiac surgery may be carried out in a bloodless field. This would make possible in the foreseeable future, the successful correction of transposition of the great vessels and of interventricular septal defects.

In the field of acquired heart disease the most notable achievement has been the correction of mitral stenosis. In 1926 Souttar dilated a stenosed mitral valve with his finger, using the same route through the auricular appendix that is used today. But strangely enough the procedure was not repeated until 1947 when Bailey, Harken, Brock, Smithy and others began operating on the mitral valve with success. At the present time an operation for mitral stenosis is a widely used procedure giving relief to many hundreds of cardiac cripples. The surgical cure of aortic stenosis has been successful in an increasing number of cases. Beck is endeavoring to revascularize the heart in coronary ischemia. Saccular aneurysms of the aorta have been successfully excised by Cooley, DeBakey and Bahnson. Previous to this they had been treated by wiring steel wire or insulated wire with electric coagulation being used. Blakemore using electric coagulation technique has been successful in treating fusiform

* This interesting specialty is also considered in Chapter 19, p. 241.

arteriosclerotic aneurysms of the abdominal aorta In the last five years the use of arterial and aortic homografts, preserved in a nutrient medium of by rapid freezing, has been developed The aortic grafts have been used to bridge large defects produced by excision of a coarctation (Gross) and in thrombosis of the aortic bifurcation The arterial grafts have been used in peripheral arteries usually the iliac or the femoral artery where these vessels have been obliterated by thrombus The obliterated area is excised and continuity restored by the graft with gratifying results in many cases

The surgery of portal hypertension has developed much over the last eight years Previous to this, Vidal in 1903 claimed a successful porto caval anastomosis in a patient with portal hypertension, De Martell in 1910, and Rosenstein in 1911 each reported a successful porto caval anastomosis Whipple has added greatly to the knowledge of this subject Blakemore and Lord in 1945 reported the non suture method of blood vessel anastomosis using vitellium tubes In that same year Whipple and Blakemore reported 10 cases of portal systemic shunts on patients with portal hypertension Five of these were porto caval anastomoses and 5 were spleno renal anastomoses Since this time several surgeons both in America and England have reported series of cases of portal hypertension treated by venous shunts for hemorrhage from esophageal varices with good results The vitellium tube technique has now been replaced by the ordinary vascular suture method of anastomosis

BURNS

The treatment of burns has undergone great changes in the last fifty years and has swung through a complete cycle Thus in the United States some fifty years ago open dressings were used Previous to this, and subsequently oily dressings were the common form of application In World War I paraffin and ambrin were introduced In 1928, the tanning method of treatment with tannic acid and silver nitrate or the triple analine dyes was developed Then from 1935 onwards, saline baths followed by the Bunyan Stannard envelope with sodium hypochlorite solution were advocated During World War II, pressure dressings were introduced, and more recently still there has been a complete *volte face* with reversion to the open method of dressing combined with the use of antibiotics to control infection But whatever initial method is used, it is generally accepted that early skin grafting for full thickness burns is indicated The pathology and treatment of the shock due to burns is now well understood, and the liberal use of saline, plasma, and blood in quantities according to the area of the burn has done much to reduce the mortality in the initial period, and antibiotics have been a great help in controlling the infection in the later stages

SUMMARY

In tracing the progress of surgery for the past three quarters of a century it is recognized that this progress has been probably greater than during any such similar period But it is well to bear in mind that this may be due, in part, to concurrent improvement of communication between men and between countries The vast expansion in printing the multiplication of surgical journals, the ease and speed of communication by letter, by telephone, by radio, and by television, have all played a part in the rapid and wide dissemination of knowledge The evolution of the graduated residency training system in this country and of the apprentice system in England has provided training in surgery along sound and safe lines The application of the Hunterian principle of proof by experimentation has borne fruit

In this review of surgery an endeavor has been made to mention the most striking features and to emphasize the general principles which have been of vital importance In considering recent developments it is hard to see these in the true perspective of history rather than in the light of present day enthusiasm Surgery has conquered many problems, but many more lie before it, such as the treatment of carcinoma of the stomach and of the head of the pancreas, and of bladder tumors In these matters surgery at the present time is really only palliative The surgery of hypertension and of peptic ulceration may well recede into insignificance as medical treatment of these conditions is eventually developed just as the surgery of suppuration and infection has been profoundly reduced by the use of chemotherapeutic and antibiotic agents

Over the past seventy five years the art of surgery has progressed far How far it will go in the next seventy five years lies in the realm of interesting speculation

BIBLIOGRAPHY

1 Aird, I *Companion in Surgical Studies*, Edinburgh, E & S Livingstone Ltd, 1949
2 Alexander, J Fifty Years of Thoracic Surgery, Am J Surg, *51* 217, 1941
3 Bailey, H, and Bishop, W J *Notable Names in Medicine and Surgery*, London, H K Lewis & Son, 1944
4 Blalock, A A Consideration of Some of the Problems in Cardiovascular Surgery, J Thor Surg, *21*, 543, 1951
5 Brackett, E G Fifty Years of Orthopedic Surgery Am J Surg *51*, 110, 1941
6 Browder, J Advances in Neurological Surgery during the Past Fifty Years Am J Surg, *51*, 187, 1941
7 Castiglioni, A *A History of Medicine*, New York, A A Knopf, 1941
8 Cope, Z *Pioneers in Acute Abdominal Surgery*, London, Oxford University Press, 1939
9 Friedell, M T, and Walters W A Half Century of Abdominal Surgery, Am J Surg, *51*, 66, 1941

10 Garrison, F H *An Introduction to the History of Medicine*, Philadelphia, W B Saunders Co , 1929
11 Graham, E A *Yearbook of General Surgery, 1952*, Chicago, The Year Book Publishers, Inc , 1952
12 Haight, C Congenital Atresia of the Esophagus with Tracheoesophageal Fistula, Ann Surg , *120*, 623, 1944
13 Halsted, W S *Surgical Papers*, Baltimore, The Johns Hopkins Press, 1924
14 Harkins, H N A Fifty Year Review of Surgery, Quart Rev Surg , *8*, 2, 1951
15 Heuer, G H Dr Halsted Supplement to Bull Johns Hopkins Hosp , 90, 1952
16 Heyd, C G The Evolution of Modern Surgery, Am J Surg , *51*, 34, 1941
17 Matas, R Surgical Operations Fifty Years Ago , Am J Surg , *51*, 40, 1941
18 Nanson, E M The Present Status of Cardiac Surgery , New Zealand Med J , *50*, 237, 1951
19 Taylor, H C , Jr Notes on Fifty Years of Progress in Gynaecology, Am J Surg , *37*, 97, 1941
20 Weiner, A S *Blood Groups and Transfusions*, 3rd ed , Springfield, Illinois, Charles C Thomas, 1943
21 Wolff, Werner Black Star Publishing Co , *Operating Room Technique, 1952*, which appears in The Johns Hopkins Magazine, December 1952
22 Young, H H Fifty Years Progress in Urology, Am J Surg , *51*, 120, 1941

Michael E DeBakey

Denton A Cooley

~ 19 ~

THORACIC SURGERY

By Michael E DeBakey, M D

Judson Taylor Professor of Surgery, Baylor University College of Medicine, Houston, Texas

and

Denton A Cooley, M D

Assistant Professor of Surgery, Baylor University College of Medicine, Houston Texas

FEW areas in medicine have exhibited the phenomenal progress that has taken place in the field of thoracic surgery during the past seventy five years Indeed, the growth and scope of this field of endeavor have been so progressive and broadened that it is impossible, in a review of this kind with its limitation of space, to do little more than summarize the more significant accomplishments and indicate the trends of development by comment Some idea of the extent of this progress may be gained by contrasting the status of thoracic surgery as reflected by Paget s comprehensive text on this subject published in 1896 with comparable current publications Thus, only 10 of the 462 pages comprising Paget s book were devoted to intrathoracic neoplasms, and most of the remainder of the book was concerned with traumatic wounds of the chest infections empyema, and lesions of the thoracic wall

Although by this time the full impact of the two most revolutionary discoveries in surgery, anesthesia and asepsis, had become evident in the vast extension of the technology of surgery, it did not include the thoracic area of the body The lag in the application of these technologic advances to lesions of intrathoracic structures was due in great measure to deficient knowledge of cardiorespiratory functions and to inadequate diagnostic facilities As expressed by Churchill,[25] "Surgical conquest of the thorax required more precise delineation of localized disease than was afforded by the stethoscope of Laennec," and, 'The art of anesthesia required extension of its scope beyond simple obliteration of pain to include the maintenance of life supporting oxygenation before the surgeon

could expose and dissect the respiratory organs" The solution to one of these major problems came with the discovery of roentgenography by Roentgen in 1895 and its subsequent refinements to include the use of opaque media [128] A few years later Killian[86 105] introduced the use of the bronchoscope These important developments thus provided the neces sary diagnostic facilities both for more precise localization of pulmonary disease and for the more frequent and early recognition of intrathoracic lesions that might require operative removal

There remained, however, another major barrier to the surgical attack upon intrathoracic lesions namely, anesthesia in the presence of an open pneumothorax The dangers associated with open pneumothorax had long been recognized but the underlying principles of this condition were poorly understood In this connection it is of historical interest that as early as the sixteenth century the great anatomist of Padua, Andreas Vesalius had through animal experimentation gained considerable knowledge of the disturbance of intrathoracic pressure on cardiorespira tory function After exposing the transparent parietal pleura in living animals he would demonstrate to his students the collapse that would occur in the lungs following perforation of this membrane and the rapid weakening of cardiac motion "In order to restore life to the animal," he observed that it was necessary to make an opening "in the upper part of the trachea, into which a pipe made from a reed is introduced And when it is blown into as the lung rises up, the animal receives air The lung should be inflated to the degree to which it occupied the thorax in life The heart now gathers new strength and its motion will change beautifully" Had it only been remembered Vesalius had here provided "the key to what afterwards proved to be the most difficult part of thoracic surgery, that is, safe access to the pleural cavity and the lung" [82]

The rediscovery of this principle was brought about in great measure through the pressing need for safe surgical access to intrathoracic lesions that became increasingly apparent with the rapidly advancing technology *of surgery at the turn of the century In general, two methods of ap* proach were pursued one utilizing the negative pressure principle[119] and the other employing positive pressure[93 94 109 137 138] much as Vesalius had developed it The latter method proved to be far more efficient and practical and its perfection by Meltzer and Auer in 1909, which led to its clinical application by Elsberg the following year, represents one of the great milestones in thoracic surgery [97] During the next decade par ticularly as a consequence of the intensive interest in problems of thoracic disease and injury generated during World War I, further contributions to a better understanding of cardiorespiratory physiology were made especially by Graham in his fundamental investigations with the Em pyema Commission [65 66] In this connection, cognizance should be taken of the influence of military surgery in furthering knowledge of under

lying physiologic disturbance in chest disease and injury as well as in advancing the management of thoracic surgical problems [29 33 34 48]

Thus, with these two major fundamental achievements more adequate diagnostic facilities by roentgenography bronchoscopy and bronchography for the precise localization of intrathoracic disease and the development of an effective means for maintaining anesthesia and oxygenation in the presence of an open pneumothorax, the way was open for the surgical conquest of intrathoracic disease

PULMONARY RESECTION

Interest in pulmonary resection for disease of the lung long preceded its successful clinical application Indeed, Rolandus is credited with the first total pneumonectomy in animals as early as 1492 Late in the nineteenth century both Gluck[43] and Biondi[14] demonstrated experimentally the feasibility of resection of an entire lung and in 1891 Tuffier[156] reported successful performance of limited pulmonary resection in a patient for tuberculosis of the upper lobe During the next several decades there appeared a number of sporadic reports of partial or complete lobectomy, mostly for tuberculosis or bronchiectasis but results were generally unsatisfactory Indeed, even as late as 1935 in summarizing the discussion on lobectomy for bronchiectasis, Graham and associates[68] stated that "although improvements in methods of operating have been introduced in recent years, nevertheless the operation remains even in the best hands, one of the most serious procedures in the surgical repertory" Although they hesitated to draw conclusions concerning its value and disadvantages, they observed that 'in 212 collected cases no less than 72 patients (34 per cent) have died apparently because of the operation and apparently in only 99 patients (47 per cent) was a thoroughly satisfactory result obtained Even if we take only the more recent and the more favorable figures we still find that a patient with bronchiectasis who submits to a lobectomy runs about a 15 to 20 per cent risk of dying because of the operation, and that if he recovers from the operation he has only about a 65 per cent chance of having a thoroughly satisfactory result with solid healing of the wound"

In order to avoid the generally unfavorable results of pulmonary resection during this early period various operations were devised including such procedures as pneumotomy or bronchotomy, exteriorization thoracoplasty, and cautery pneumonectomy These procedures, however, were doomed to failure, as experience demonstrated, owing to their violation of sound surgical principles With the report of Brunn, in 1929, and that of Shenstone and Janes, a few years later, forcefully emphasizing the feasibility and value of lobectomy in bronchiectasis, there was a revival of interest in this method of pulmonary resection which conformed to sounder surgical principles This is clearly reflected in

Churchill's[37] report of 1937 in which he not only recognized the influence of these technologic contributions, declaring them "a turning point in the development of the operation," but also confirmed their value by the highly impressive results of his own experience With his achievement of a total mortality of 6 1 per cent in a series of 49 patients in whom lobectomy or total pneumonectomy was undertaken for bronchiectasis or cystic disease and of no deaths in the last 30 successive cases, there was no longer any doubt of the soundness or desirability of this approach to the problem It must be recognized however as Churchill emphasized so well that in the meantime certain important elements had contributed materially to the development of pulmonary resection, including particularly 'the perfection of anesthesia technics, the recognition of the hazards of anoxemia, an increased use of bronchoscopy in diagnosis and above all a dissemination of knowledge concerning the surgical physiology of the chest ' Perhaps of equal, if not of greater, importance in stimulating the surgical development of pulmonary resection during this period were the reports by Nissen in 1931 and Haight[72] in 1932 of a successful one stage pneumonectomy for bronchiectasis, and the striking achievement of Graham[67] in 1933 of the first successful one stage pneumonectomy for carcinoma of the left lung It is of historical interest to note that later in the same year Churchill[38] successfully performed a similar procedure for carcinoma of the right lung The significance of Graham's achievement lies in the widespread interest it produced and the great impetus it provided by forcefully directing attention to a curative method of therapy for a hitherto hopeless disease It thus had great influence in stimulating more intensive interest and investigative work in the procedure of pulmonary resection leading to further improvements and refinements of techniques

Resection of a lung or one of its lobes up to this time consisted of mass ligation of the hilum, and whereas the tourniquet method of Shenstone and Janes was a distinct technical improvement, the procedure was not entirely satisfactory, owing to the mass of devitalized and necrotic tissue that remained in the hilar stump with the frequent subsequent development of infection hemorrhage and bronchial fistulization In recognition of these disadvantages and as a consequence of the studies generated by the impressive achievement of Graham, the individual ligation technique of pneumonectomy for malignant disease was developed by Rienhoff[112] and Crafoord[43] and for lobectomy by Blades and Kent

The next and perhaps one of the most important contributions to this phase of the subject because it provided a conceptual as well as a technologic advance was made by Churchill and Belsey in 1939 in their consideration of the bronchopulmonary segment, rather than the lobe, as the fundamental surgical unit of the lung Although such an anatomic configuration had been previously suggested,[97] it remained for these investigators to define the surgical significance of this concept and to

demonstrate its clinical application in the development of the procedure of segmental pulmonary resection Accordingly, emphasis was placed upon accurate delineation of the diseased area of the lung in order to achieve the proper goal of extirpational surgery, namely, the removal of all diseased tissue with the maximum conservation of normal tissue This concept thus established the basis of modern pulmonary resection procedures and provided the means for the current high standards of excisional lung surgery

The importance of these developments in the advancement of extirpational surgery for pulmonary disease is reflected in their influence upon the management of certain diseases of the lung, such as carcinoma and tuberculosis This is well demonstrated by a comparison of the status of the surgical treatment of carcinoma of the lung in 1939 with the picture presented in a review of the subject only thirteen years later Thus in the former period it was possible to collect from the world literature only 86 recorded cases of pneumonectomy for malignant disease of the lung [99] The operative mortality in this series was 63 9 per cent and the five year survival rate was undeterminable In contrast with these figures, in the more recent review of this subject it was possible to collect merely by a sample survey of the literature well over 2,000 resected cases [68] The operative mortality at this time had been reduced to about one fifth of the earlier figure with a five year survival rate among the resected cases of about 20 per cent

While these figures clearly demonstrate the great strides that have been made in thoracic surgery during the past few decades, of perhaps greater importance is the changing emphasis upon the surgical approach to intrathoracic disease that has been brought about by these developments With continued improvements in anesthesia, in the control of infection, and in the roentgenographic detection of intrathoracic lesions, there has been a progressive shift in emphasis toward exploratory thoracotomy as a means of establishing diagnoses as well as providing curative therapy in the earliest and even asymptomatic stage of disease As emphasized in a recent article on this subject, the demonstration of an abnormal shadow by means of roentgenographic examination of the chest "demands aggressive action to establish the diagnosis, and when other measures fail to reveal the exact nature of the lesion, prompt exploration is indicated Under these circumstances the risk of exploration, except in the aged and the debilitated, may now be considered less than that involved by the consequences of delay' [67] For similar reasons there has been growing advocacy of this attitude in the management of mediastinal tumors [61 118] The present day general acceptance of this attitude is in itself convincing evidence of the great strides that have been made in thoracic surgery since the turn of the century, thus confirming the hopeful prediction of Adler, who more than four decades ago declared that

"there is every reason to hope that the technique of this new branch of surgery will be still further developed and that in the near future thoracotomy and operation on the lungs will be attended by no more risk than peritoneal operation today," and when all other means of diagnosis fail, there will be "as little hesitation in resorting to an exploratory thoracotomy as there is now in submitting to an exploratory laparotomy"

Pulmonary resection in the treatment of tuberculosis lesions of the lung has been applied clinically on a small scale since Tuffier's[136] first successful resection for apical tuberculosis in 1891. For the most part and until relatively recently, resections for pulmonary tuberculosis were done unintentionally or on an erroneous diagnosis, and the results were generally poor. Thus in 1942, Thornton and Adams reviewed the literature and found 29 reported pneumonectomies for tuberculosis with a mortality rate of 46 per cent and 51 lobectomies with a mortality rate of 25 per cent. The complications which accounted for most deaths were postoperative tuberculous empyema, bronchopleural fistula, and extension of the disease to previously uninvolved areas in the lung. It is not surprising that rigid rules were established for selection of cases for pulmonary resection, and only when there was almost no hope for a cure by collapse or other measures was a resection planned. These discouraging results prevented general acceptance and wider application of the procedure. With the report of Churchill and Klopstock in 1943 emphasizing the value of improved methods of lobectomy applied as a highly selective procedure for well circumscribed lesions, interest was revived in this method of therapy.

The discovery of streptomycin in 1944 by Waksman and others[124] by providing the first effective antimicrobial agent against the tubercle bacillus greatly broadened the possibilities of excisional therapy. This was further enhanced by the addition of para aminosalicylic acid (PAS) which intensified the value of streptomycin therapy. The incidence of complications after resections in tuberculous cases has been greatly reduced and the trend is now toward resection in most cases of pulmonary tuberculosis in preference to other surgical measures.[7 30 39 45 80 83 84 87 95 104 117 133]

A very recent policy has been to continue chemotherapy as long as there is roentgenographic evidence of clearing of the tuberculous process and then the residual foci are resected. Of interest is the fact that from these foci, which often contain necrotic centers, tubercle bacilli could be obtained by smear, but these organisms failed to grow on culture media. The need for resection of lesions containing "dead" bacilli has been questioned. The trend toward prolonged streptomycin PAS therapy both before and after excision shows promise of further improving results in the surgical treatment of tuberculosis.

SURGERY OF THE ESOPHAGUS*

The development of effective surgical procedures for the treatment of various lesions of the esophagus, both benign and malignant, represents another area of notable progress in the field of thoracic surgery These include particularly the more common congenital anomaly of atresia with tracheo-esophageal fistula, strictures, carcinoma, diverticula, and achalasia It is of interest to observe that although the underlying principles in the surgical approach to these lesions had in certain instances been well developed in the experimental laboratory even before the turn of the century, their successful clinical application was long delayed Thus in the surgical attack upon carcinoma of the esophagus, a number of investigators late in the nineteenth century had demonstrated, both upon the cadaver and in dogs, the feasibility of resection of the esophagus either transpleurally or extrapleurally [28 96 107 108] In 1895, Biondi[15] and a few years later, Gosset established, in experiments on dogs as well as in cadavers, the practicability of restoration of continuity by esophagogastrostomy following transpleural transphrenic resection of the distal portion of the esophagus In spite of the valiant and resolute efforts of a number of surgeons to apply these measures clinically during the next few decades, they were almost uniformly unsuccessful, owing in the main to certain technical failures and particularly to inability to control serious infections such as mediastinitis, empyema and pneumonia Efforts to avoid these difficulties by devising other operative procedures such as the abdominocervical or the extrapleural approaches or by multistaged operations, provided no better solutions to the problem [101] Indeed, it was not until 1913 that renewed hope and much impetus were given to these endeavors by Torek's report of the first successful resection of the thoracic esophagus for carcinoma using a thoracico cervical approach This patient lived for twelve years maintaining a good state of nutrition by connecting the cervical esophagostomy with the gastrostomy by means of a rubber tube Unfortunately, the renewed hope provided by this significant achievement was short lived and the results of surgical endeavors for approximately the next two decades remained disheartening

With Ohsawa's report in 1933 of 8 recoveries in 18 resections for tumors of the lower esophagus and cardia, interest in the problem was again revived This was further enhanced by the report of Adams and Phemister in 1938 of successful transthoraco abdominal resection of the lower part of the esophagus and esophagogastrostomy These successful reports stimulated not only greater interest in the problem but also in more intensive animal experimentation, which led to further improvements in surgical methods and refinements in technique By 1941 when this subject was comprehensively reviewed[101] a satisfactory approach had

* This subject is also discussed in Chapter 18, p 242

been achieved for lesions of the lower esophagus and cardia, consisting essentially in extirpation of the involved area with restoration of continuity by intrathoracic esophagogastrostomy

For higher lesions, however, it was still necessary to employ the principles of the old Torek procedure, with subsequent multistaged antithoracic esophagoplasty for restoring continuity of the alimentary tract The results of this procedure proved generally unsatisfactory. In 1944, Garlock[61] and Sweet[129] demonstrated that the stomach could be adequately mobilized by division of the left gastric artery and vasa brevia to bring it to the highest levels of the chest and even into the cervical region for esophagogastrostomy This important development then made it possible to employ a safe and satisfactory surgical procedure with immediate restoration of function for benign as well as malignant obstructive lesions involving all levels of the esophagus More recently, Lewis advocated a combined right thoracoabdominal approach for lesions situated at levels higher than the lower third of the esophagus, the advantages of which have gained for it increasing acceptance

The gratifying progress which has thus been made particularly during the past few decades, in the surgical treatment of carcinoma of the esophagus is reflected by Sweet's[131] recent report on his experience in 254 patients in whom resection was performed Of 147 patients with lesions involving the cardia and lower end of the esophagus, 88 4 per cent survived the operation and 17 5 per cent survived more than five years Unfortunately, the results are not nearly as encouraging for lesions higher in the esophagus, with only a 4 per cent five year survival rate in Sweet's experience In most instances such lesions have already extended beyond the limits of the esophagus by the time surgical treatment is made available For this reason efforts directed toward alleviation of the most distressing symptom of the disease, namely, inability to swallow, have received increasing attention with encouraging results [49]

Other esophageal diseases in which notable technologic progress has also been made include atresia with tracheoesophageal fistula and diverticula With the reports by Leven[88] in 1941 of the first successful case of congenital atresia with tracheo-esophageal fistula treated by extrapleural ligation and subsequent antethoracic esophagojejunostomy, and by Haight and Towsley a few years later of the first successful case in which reconstruction of esophageal continuity by primary anastomosis was performed considerable impetus was given to this problem Since then, numerous workers have reported increasingly successful results in the surgical management of this condition This gratifying progress is well exemplified in the recent report of Leven and associates[89] concerning a series of 103 cases in which primary anastomosis was performed in 68 cases with survival in 43

Further evidence of progress in this area of thoracic surgery is reflected in the development of the surgical treatment of diverticula of the

thoracic esophagus [62] The surgical approach to this problem during the first few decades after the turn of the century, consisted essentially in staged mediastinotomy and drainage or diverticulogastrostomy through a transabdominal transdiaphragmatic approach, was generally unsatisfactory Within the past two decades the transpleural approach was developed providing direct attack upon the lesion by adequate exposure and thus permitting the more satisfactory procedure of complete extirpation of the diverticulum with proper repair of the opening in the esophagus

Other esophageal lesions which have long attracted the interest and attention of thoracic surgeons include achalasia or cardiospasm, esophagitis, and esophageal hiatal hernia Various surgical procedures have been developed and proposed for the correction of achalasia or cardiospasm,[100] but none of these has proved entirely satisfactory These experiences, however, have led to a more intensive study of the problem resulting in an appreciation of the complications of esophagitis which may be a consequence of further disturbance in the function of the cardia [3 9–12 103 113] This is reflected in the recent contributions of Barrett and Franklin,[11] Allison,[3] and Sweet[132] emphasizing the importance of preservations of the sphincter mechanism at the cardia both in the treatment of achalasia and hiatal hernia

CARDIOVASCULAR DISEASES*

Surgery of the heart and great vessels is the newest addition to the field of thoracic surgery and offers a bright future with possibilities of further discoveries which will broaden its scope tremendously [18 48] As would be expected, treatment of cardiac wounds provided the first opportunity to perform surgical procedures on the heart In 1896, Rehn successfully sutured a penetrating wound of the heart and by demonstrating that the heart would tolerate such manipulation, marked the beginning of modern cardiac surgery Suture of penetrating wounds of the heart has since become commonplace, and a number of surgeons have accumulated sizable series of successfully treated cases [13 58 59] During World War II, Harken[74–76] demonstrated the feasibility of removing retained intracardiac foreign bodies, thus providing another illustration of the influence of the surgery of trauma in inspiring further advances More recently, a less aggressive attitude toward the management of penetrating wounds and foreign bodies has been adopted as a consequence of the work of Blalock and Ravitch[21 110] who advocate pericardicentesis and general supportive measures to combat shock in pericardial tamponade

The first surgical procedures to be applied to the heart exclusive of traumatic cases were concerned with infections of the pericardium and

* Surgery of the Heart and Great Vessels is also included in Chapter 18, p 247

external drainage of purulent collections Before Delorme[54] and Schmie den[121 122] emphasized the necessity for surgical intervention in chronic constrictive pericarditis, the condition was infrequently recognized clinically and almost uniformly fatal Now the so called Beck's triad of the small quiet heart, ascites, and increased venous pressure is a fam iliar clinical syndrome Surgical decortication of the heart removes the constricting scar tissue preventing adequate cardiac filling and provides restoration of normal function in about half of the cases and improvement in at least one third of the remaining cases [19 21 81]

Congenital anomalies of the major vessels at the base of the heart introduced surgery of congenital cardiovascular anomalies The first successful closure of a patent ductus arteriosus (Botalli) in 1939 by Gross[69] furnished inspiration for subsequent advances Although there is not yet complete agreement on the best technique for occlusion, the results have been found generally satisfactory and the present operative mortality in skilled hands is less than 1 per cent Coarctation of the aorta was experimentally produced and corrected by Blalock and Park in 1943 In the following year Crafoord,[41] and shortly thereafter Gross,[70] clin ically resected a coarctation and performed end to end anastomosis Subsequently, Gross made another significant contribution by inserting aortic homografts to bridge extensive defects in the aorta remaining after resections This experience may play an important role in the surgery of aortic aneurysms Arterial aneurysms have challenged the surgeon since the beginning of the Christian era but most procedures devised until this day have been largely unsatisfactory Where possible excision of the aneurysm is the logical solution This may be achieved in saccular aneurysms by excision and lateral aortorrhaphy[40 41] or in fusi form aneurysms by excision of the segment of aorta involved and restora tion of continuity with preserved aortic homografts [50 57] Further ad vances in the surgery of congenital anomalies of the great vessels include division of anomalous aortic rings about the trachea and esophagus re implantation of anomalous pulmonary veins entering the right side of the heart and closure or excision of pulmonary arterio venous fistulas [18 46]

With improvement in precise diagnosis made possible by perfection of electrocardiography and the introduction of cardiac catheterization by Cournand[42] and angiocardiography by Robb and Steinberg the stage was set for surgery of cardiac defects The brilliant contribution in 1944 of Blalock and Taussig in anastomosing a systemic artery to the pulmonary artery in cases of tetralogy of Fallot to overcome the pulmonary ischemia and peripheral cyanosis not only opened the way for cardiac surgery, but also introduced a new concept to surgery of the heart based upon physio logic principles By adding an artificial patent ductus arteriosus to the complex known as tetralogy of Fallot, cyanosis was relieved indirectly leaving the basic pulmonary stenosis unchanged Later attempts to

apply this, a similar indirect approach, to other cardiac lesions, have met with limited success.

For this reason a more direct attack upon certain cardiac lesions, particularly valvular stenoses, had logical appeal. Through the efforts of Smithy, Bailey,[5] Harken,[77–79] and Brock[8,26] during the past six years, a clinically satisfactory operation for mitral stenosis has been developed. An accurate understanding of the mechanism of valvular function has reduced the danger of creating mitral insufficiency after the stenosis has been overcome. Separation of the leaflets along the line of fusion at the commissures is the technique more generally employed. For pulmonic stenosis, usually a congenital lesion, Brock[25] has introduced another direct operation for a valvular defect. Where the stenosis is strictly valvular and associated with an intact ventricular septum Brock[25] and Sellors[123] incise and dilate the valve by a transventricular approach. In patients with tetralogy of Fallot in whom obstruction to the pulmonary outflow tract is in the subvalvular or infundibular zone, infundibular resection may be indicated. Aortic stenosis is the most recent stenotic lesion to challenge the surgeon, and Bailey's[5] technique for aortic valvulotomy based upon the commissurotomy principle shows great promise.

SUMMARY

To date, surgery of valvular regurgitation has been disappointing, and most developments are still in an experimental stage. The mechanisms preventing valvular insufficiency, particularly of the atrioventricular valves, are so complex that a bloodless surgical field provided perbaps by a mechanical heart may be the necessary solution.

Closure of septal defects presents still another unsolved problem. Ventricular septal defects are not at present satisfactorily treated surgically, largely because of their frequent proximity to tbe aortic and pulmonary valves. Recently, however, atrial septal defects bave been successfully closed by a number of surgeons using several types of procedure.[71,90] These efforts directed toward a direct surgical attack upon intracardiac lesions have stimulated more intensive interest in the development of a method to provide extracorporeal circulation in order to permit exclusion of the heart and lung during the period required for intracardiac surgery. The original studies of Gibbon and his associates[62,128,133] and the more recent investigations[18,55,58,85,140] of a number of other workers in this field offer great promise in extending the scope of cardiac surgery.

BIBLIOGRAPHY

1. Adler, I.: *Primary Malignant Growths of the Lungs and Bronchi*, London, Longmans, Green & Co., 1912.
2. Adams, W. E., and Phemister, D. B.: J. Thoracic Surg., *7*, 621, 1938.

3 Allison, P R Surg , Gynec & Obst , *92*, 419, 1950
4 Bailey, C P Material presented at the American College of Physicians, Cleveland, 1952
5 ———— Dis of Chest, *15*, 377, 1949
6 Bailey, C P , Ramirez, H P R , and Larzelere, H B J A M A , *150*, 1647, 1952
7 Bailey, C P , Glover, R P , and O'Neill, T J E J Thoracic Surg , *18*, 36, 1949
8 Baker, Charles, Brock, R C , and Campbell, M Brit M J , *1*, 1283, 1950
9 Barrett, N R Royal Soc Med , *43*, 421, 1950
10 ———— Brit J Surg , *38*, 175, 1951
11 Barrett, N R , and Franklin, R H Brit J Surg , *37*, 194, 1949
12 Benedict, E B , and Sweet, R H Gastroenterol , *11*, 618, 1948
13 Bigger, I A J Thoracic Surg , *8*, 239, 1939
14 Biondi, D Gior internaz d Sc med , Napoli, N S , *4*, 759, 1882 and *5*, 248, 417, 1883
15 ———— Policlinico, *1*, 964, 1895
16 Bjork, V O Acta Chir Scandinav , *96* (Supp 137), 1948
17 Blades, Brian, and Kent, Edward M J Thoracic Surg , *10*, 84, 1940
18 Blalock, A J Thoracic Surg , *21*, 543, 1951
19 Blalock, A , and Burwell, C S Surg , Gynec & Obst , *73*, 433, 1941.
20 Blalock, A , and Park, E A Ann Surg , *119*, 445, 1944
21 Blalock, A , and Ravitch, M M Surgery, *14*, 157, 1943
22 Blalock, W , and Taussig, H B J A M A , *128*, 189, 1945
23 Bland, E F , and Sweet, R H J A M A , *140*, 1259, 1949
24 Brock, R C , and Campbell, M Brit Heart J , *12*, 403, 1950
25 Brock, R C Brit M J , *2*, 399, 1949
26 ———— Brit Heart J , *13*, 489, 1952
27 Brunn, H B Arch Surg , *18*, 490–515, 1929
28 Bryant, J D Tr Am S A , *13*, 443, 1895
29 Carter, B Noland, and DeBakey, Michael E J Thoracic Surg , *13*, 271, 1944
30 Chamberlain, J M , and Klopstock, R J Thoracic Surg , *20*, 843, 1950
31 Churchill, E D Arch Surg , *19*, 1437, 1929
32 ———— J Thoracic Surg , *6*, 286, 1937
33 ———— Ann Surg , *120*, 269, 1944
34 ———— The Mitchell Banks Lecture on Gunshot Wounds of the Chest, University of Liverpool, 3 Nov , 1948
35 ———— New England J Med , *244*, 799, 1951
36 Churchill, E D , and Belsey, R Ann Surg , *109*, 481, 1939
37 Churchill, E D , and Klopstock, R Ann Surg , *117*, 641, 1943
38 Churchill, E D , Sweet, Richard H , Soutter, Lamar, and Scannell, J Gordon J Thoracic Surg , *20*, 349, 1950
39 Claggett, O T , and Seybold, W D Proc Staff Meet , Mayo Clin , *23*, 81, 1948
40 Cooley, Denton A , and DeBakey, Michael E Ann Surg , *135*, 660, 1952
41 ———— (To be published)
42 Cournand, A , and Ranges, H A Proc Soc Exper Biol & Med , *46*, 462, 1941
43 Crafoord, C Acta Chir Scandinav , Supp 54, *81*, 1, 1938
44 Crafoord, C , and Nylin, G J Thoracic Surg , *14*, 347, 1945
45 Day, J C , Tuttle, W M , O Brien, E J , Hampton, F , and Jackson, T L · J Thoracic Surg , *20*, 854, 1950

46 DeBakey, M E Annual Review of Med , pp 79–96, 1950
47 ———— The American Surgeon, *19*, 1, 1953
48 DeBakey, M E , and Carter, B Noland Ann Surg , *121*, 545, 1945
49 DeBakey, M E , and Cooley, Denton A Arch Surg (In Press)
50 ———— (To be published)
51 DeBakey, M E , and Creech, Oscar Texas State J Med , *46*, 588, 1950
52 DeBakey, Michael E , Heaney, John, and Creech, Oscar J A M A , *150*, 1076, 1952
53 DeBakey, Michael E , Ochsner, Alton, and DeCamp, Paul T Surgery, *32*, 877, 1952
54 Delorme, Edmond Bull et mem Soc de chir de Paris, *24*, 918, 1898
55 Dennis, C , Spreng, D C , Jr , Nelson, G E , Karlsen, K E , Nelson, R M , Thomas, J V , Eden, W P , and Varco, R L Ann Surg , *134*, 709, 1951
56 Doddrill, F D , Hill, E , and Gerisch, R A J A M A , *150*, 637, 1952
57 Dubost, Charles, Allary, M , and Oeconomos, Z Archeo des Mal de Coeur et des vaisseaux, *44*, 848, 1951
58 Elkin, D C Ann Surg , *120* 877, 1944
59 Elkin, D C , and Campbell, Ray E Ann Surg , *133*, 623, 1951
60 Elsberg, C A Med Record, *77*, 493, 1910
61 Garlock, J H Surg , Gynec & Obst , *78*, 23, 1944
62 Gibbon, J H , Jr Surg , Gynec & Obst , *69*, 602, 1939
63 Gluck, T Berl klin Wchnschr , *18*, 645, 1881
64 Gosset, A Rev de Chir , *28*, 694, 1903
65 Graham, E A North Carolina Med J , *9*, 152, 1948
66 Graham, E A , and Bell, R D Am J M Sci , *156*, 839, 1918
67 Graham, E A , and Singer, J J J A M A , *101*, 1371, 1933
68 Graham, E A , Singer, J J , and Ballon, H C *Surgical Diseases of the Chest*, Philadelphia, Lea & Febiger, 1935
69 Gross, R E , and Hubbard, J P J A M A , *112*, 729, 1939
70 Gross, R E , and Hufnagel, C A New England J Med , *233*, 287, 1945
71 Gross, R E , Watkins, E , Jr , Pomeranz, A A , and Goldsmith, E I Surg , Gynec & Obst , *96*, 1, 1953
72 Haigh, C Surg , Gynec & Obst , *58*, 768, 1934
73 Haight, C Cameron, and Towsley, H A Surg , Gynec & Obst , *76*, 672, 1943
74 Harken, D E Surg , Gynec & Obst , *83*, 117, 1946
75 Harken, D E , and Williams, A C Am J Surg , *72*, 80, 1946
76 Harken, D E , and Zoll, P M 111 Am Heart J , *32*, 1, 1946
77 Harken, E E , Ellis, L B , Ware, P F , and Norman, L R New England J Med , *239*, 801, 1948
78 Harken, D E , Ellis, L B , and Norman, L R J Thoracic Surg , *19*, 1, 1950
79 Harken, D E , Dexter, Lewis, Ellis, L B , Farrand, R E , and Dobson, J F Am Surg , *134*, 722, 1951
80 Himmelstein, A , Berry, F B , and Read, C T J Thoracic Surg , *20*, 866, 1950
81 Holmer, E , and Willett, F Surg , Gynec & Obst , *89*, 129, 1949
82 Homans, John *A Textbook of Surgery*, 6th ed , Springfield, Charles C Thomas, 1945
83 Janes, R M Edinburgh M J , *57*, 369, 1950
84 Jones, J C , and Robinson, J L J Thoracic Surg , *20*, 882, 1950
85 Jongbloed, J S G O , *89*, 684, 1949
86 Killian, H Cited by Clerf, L H Ann Med Hist , *8*, 547, 1936

88 Leven, N L J Thoracic Surg, *10*, 648, 1941
89 Leven, N Logan, Varco, Richard L, Lannin, Bernard G, and Tongen Lyle A Ann Surg, *136*, 701, 1952
90 Lewis, F J, and Taufic, M Surgery, *33*, 52, 1953
91 Lewis, Ivor Brit J Surg, *34*, 18, 1946
92 Martin, Ruth North Carolina Med J, *9*, 91, 1948
93 Matas, R Am Med, Jan 18, 1902, Tr South Surg & Gynec Assoc, *12*, 52, 1902
94 Meltzer, S J, and Auer, J J Exper Med, *11*, 622, 1909
95 Moore, J A, Murphy, J D, and Elrod, P D J Thoracic Surg, *18*, 45, 1949
96 Nassilov Quoted by Stoyanov, P I Rev de Chir, *19*, 388, 1899
97 Nelson, H P Brit Med J, *2*, 251, 1934
98 Nissen, R Zentralbl f Chir, *58*, 3003, 1931
99 Ochsner, Alton, and DeBakey, Michael Surg, Gynec & Obst, *68*, 435, 1939
100 ——— Arch Surg, *41*, 1146, 1940
101 ——— J Thoracic Surg, *10*, 401, 1941
102 Ohsawa, T Arch f Jap Chir, *10*, 605, 1933
103 Olsen, A M, Harrington, S W, Moersch, H J, and Anderson, H A J Thoracic Surg, *22*, 164, 1951
104 Overholt, R, Wilson, N J, Szypulski, J T, and Langer, L Am Rev Tuberc, *55*, 198, 1947
105 Paget, S *The Surgery of the Chest*, Bristol, John Wright & Co, 1896
106 Patterson, Ellen J The Laryngoscope, *36*, 157, 1926
107 Potarca, J Romania med, *2*, 116, 1894
108 Quenu and Hartmann Bull et mem Soc de Chir de Paris, *17*, 82, 1891
109 Quenu and Longuet Comp rend Soc de biol Paris, *3*, 1007, 1896
110 Ravitch, M M, and Blalock, Alfred Arch Surg, *58*, 463, 1949
111 Rehn, L Arch f Klin Chir, *55*, 315, 1897
112 Reinhoff, W F, Jr Bull Johns Hopkins Hosp, *53*, 390, 1933
113 Ripley, H R, Olsen, A M, and Kirklin, J W Surg, *32*, 1, 1952
114 Robb, G P, and Steinberg, I A J Clin Investigation, *17*, 507, 1938
115 Roentgen, W C Am J Roentgenol, *10*, 320, 1923
116 Rolandus quoted by Murphy, J B J A M A, *31*, 341, 1898
117 Ryan, B J, Medlar, E M, and Welles, C S J Thoracic Surg, *23*, 327, 1952
118 Sabiston, David C, Jr, and Scott, H Wm, Jr Ann Surg, *137*, 777, 1952
119 Sauerbruch, E F J A M A, *51*, 808 1908
120 Scannell, J G New England J Med, *247*, 800 and 843, 1952
121 Schmieden, V Surg, Gynec & Obst, *143*, 89, 1926
122 ——— Med Klin, *16*, 29, 1921
123 Sellors, T H Lancet, *1*, 988, 1948
124 Shatz, Albert, Bugie, Elizabeth, and Waksman, S A Proc Soc Exper Biol & Med, *55*, 66, 1944
125 Shenstone, N S, and Janes, R M Canad Med Assoc J, *27*, 138, 1932
126 Sicard, J A, and Forestier, J Bull Mem Soc Med Hôp Paris, *46*, 463, 1922
127 Smithy, H G Proc. 16th Assembly, Southeastern Surg Congress, Hollywood, Fla, April 1948
128 Stokes, Thomas Lane, and Gibbon, John H, Jr Surg, Gynec & Obst, *91*, 138, 1950
129 Sweet, R H New England J Med, *223*, 1, 1945
130 ——— J Thoracic Surg, *19*, 298, 1950

131 ——— Surg , Gynec & Obst , *94*, 46, 1952
132 ——— Ann Surg , *135*, 1, 1952
133 Templeton, J Y , and Gibbon, J H Ann Surg , *129*, 161, 1949
134 Thornton, T F , Jr , and Adams, W E Surg , Gynec & Obst , *75*, 312, 1942
135 Torek, F J A M A , *60*, 1533, 1913
136 Tuffier, T *Chirurgie du poumon*, Paris, Masson et Cie, 1897, pp 31–36
137 ——— Presse med , Jan 27, 1906
138 Tuffier and Hallion Gaz hebd de med Paris, *43*, 1131, 1896, also Compt rend Soc de biol Paris, *3*, 951, 1896
139 Vesalius, A Cited by Homans, J *A Textbook of Surgery*, Springfield, Illinois Charles C Thomas, p 760 1931
140 Wesolowski, Sigmund A , Fisher, John H , and Welch, C Stuart Surg , Gynec & Obst , *95*, 762, 1952

JOHN H. MORRISSEY

20

UROLOGY

By John H Morrissey, M D , F A C S

Director of Urology, City Hospital of New York, Assistant Attending Urologist, New York Hospital, Urologist, St Clare's Hospital, New York, New York

IN THE year 1878 the surgical profession of Boston was agog with excitement For Doctor Henry J Bigelow had in ten months completed a sizable series of litholapaxies with a new instrument, a series which had but one single mortality Reports of his technique and descriptions of his procedures were published in The American Journal of The Medical Sciences in January of that year, in the Massachusetts Medical and Surgical Journal the following month and, in June, in the New York Medical Record Later in the year a small monograph was printed in Boston and New York for the medical profession If we could turn back the clock to that year, we would be able to witness Doctor Bigelow operating at the Massachusetts General Hospital and performing the evacuation of a considerable stone in a single sitting He recommended that no more than fifteen or twenty minutes be utilized in carrying out the procedure and reported stones weighing as much as 1,802 grains having been removed, with the result that two weeks from the date of the first operation the patient could retain his water from three to four hours He made significant observations on the chemical content of the stones and also noted that they were associated with prostatic changes which, however he apparently did not recognize as adenomatous hypertrophy of the gland The procedure revolutionized the brutal type of treatment of vesical calculi then in vogue Today, his instruments and technique unmodified constitute in skilled hands the best method of treating this condition It was the most important single surgical contribution of that year and, for that matter for many years before and afterwards, to the field of genito urinary surgery Thus the year 1878 is indeed a significant one in the history of modern urology and most appropriate to begin this seventy five year review

Urology as a pure specialty is one of the most outstanding features in the development of medicine and surgery, marked, of course, by the

in the development of the early prostatic incisors in 1830 by Guthrie, and later by Mercier However, in 1875, Bottini introduced his galvano cautery by which an obstructing prostatic lobe could be destroyed in a few minutes' time All records indicate that this instrument did some good work in cases of median bar formation, but the fact that the procedure was a blind one and employed only in selected cases permitted it to fall into discard Forty years later Chetwood of New York revived the pro cedure, which he performed through a perineal buttonhole incision with his Chetwood Bottini instrument Among the early advocates of this method were most of the leading urologists of that period However, after careful clinical appraisal, the method seemed to be regarded as use less or too dangerous to be risked, and it never came into general use Meanwhile, as the technique of open surgical prostatectomy was advancing both here and abroad, these fundamentally primitive operations soon passed into oblivion

The next period of note in the field of urology begins in 1895 with the discovery of the *x* rays by Roentgen Shortly after the report of his dis covery, urologists employed the new rays in an attempt to diagnose the presence of calculi in the urinary tract Two years later, the introduc tion of the opaque catheter, a ureteral catheter with a metal stylette, represented the first attempt to render the upper urinary tract opaque to the roentgen rays Meanwhile, the advance in urological surgery had been coincident with the development of gynecological and abdominal surgery, but the greater amount of this surgery was done by general surgeons and gynecologists rather than urological surgeons who up to that time were practically non-existent in our present day conception of the role

In partial summary, therefore, of the period ending with the turn of the century, we have seen the development of a urological instrument which still exists in its original form, the primitive conception of the trans urethral method of handling bladder neck obstruction the introduction of anesthesia in urology and its influence on general surgery the develop ment of the cystoscope and the application of roentgen rays for the de tection of shadows in the urinary tract All these may be grouped as the foundation stones of modern urological diagnosis because for all practical purposes the history of urology from the beginning up to the present time aside and apart from the technical procedures involved and the specialized surgical techniques utilized is essentially a specialty which has developed and survived by its completeness and exactitude of diag nosis

A somewhat more comprehensive view of the continued progress in urology may be had by grouping the advances and accomplishments of the thirty years from 1900 to 1930 It was during this period that the efforts of the later nineteenth century urologists began to crystallize But as one looks back on that period today, it may seem somewhat remote

separation of specialties as has occurred in other branches of medicine From then until the turn of the century, urology as a specialty continued to function largely in association with other branches of medicine and surgery, and the principal source of activity, as well as a source of revenue, to the urologist was the treatment of venereal disease and its complications Many of the latter, regrettably, were due to the forceful activities of these early urologists in applying what they thought was appropriate care of the common inflammations of the anterior and posterior urethra, the prostate, and the bladder The scientific armamentarium of that period comprised an assortment of sounds dilators, bougies, urethratomes etc , practically all of which the modern urologist would shudder at the thought of using on a patient today

Attention is directed at this point to the fact that the structure and innervation of the urinary tract lent itself readily to regional anesthesia, and the history of anesthesia in urology becomes necessarily the first history of the development of regional anesthesia elsewhere throughout the body and another early major contribution of urology to general medicine and surgery It was for urological conditions that some of the various forms of regional anesthesia were first employed, and the first paper on the use of cocaine in urology was published by Fessender Otis in 1884 It was a description of the use of an anesthetic for dilatation of the urethra Shortly after, he described a litholapaxy performed by using the same anesthetic technique

It was recognized quite early that any progress in the treatment of disease of the bladder and kidney was dependent on some practical method of investigation of the urinary tract, and that such investigation must be along the lines of visualization by means of special instruments devised for this purpose Laryngoscopy at that time was undergoing gradual improvement and development, and those interested in the urological progress felt that any advance in urological examination and diagnosis would have to be along similar lines There is no point in describing the various primitive methods of viewing the bladder, but it was not until 1874 that a Danish surgeon was able, with a combination of methods to pass for the first time a bougie into the orifice of the ureter In 1877, Nitze produced the first modern cystoscope—modern in that it employed the principles of cystoscopes today—the electric source of illumination was close to the field to be examined and a lens system was used With other modifications the first practical instrument was presented before the Medical Society of Vienna in March 1879 Time does not permit chronological description of the improvements which have finally culminated in the superb instruments available today, largely through the ingenuity of the American Cystoscope Makers, Inc in association with urologists during the past thirty three years

The realization also that specialization in the instrumentation was required for handling problems of obstruction of the bladder neck resulted

in the development of the early prostatic incisors in 1830 by Guthrie, and later by Mercier However, in 1875, Bottini introduced his galvano cautery by which an obstructing prostatic lobe could be destroyed in a few minutes' time All records indicate that this instrument did some good work in cases of median bar formation, but the fact that the procedure was a blind one and employed only in selected cases permitted it to fall into discard Forty years later Chetwood of New York revived the pro cedure, which he performed through a perineal buttonhole incision with his Chetwood Bottini instrument Among the early advocates of this method were most of the leading urologists of that period However, after careful clinical appraisal, the method seemed to be regarded as use less or too dangerous to be risked, and it never came into general use Meanwhile, as the technique of open surgical prostatectomy was advancing both here and abroad, these fundamentally primitive operations soon passed into oblivion

The next period of note in the field of urology begins in 1895 with the discovery of the x rays by Roentgen Shortly after the report of his dis covery, urologists employed the new rays in an attempt to diagnose the presence of calculi in the urinary tract Two years later, the introduc tion of the opaque catheter, a ureteral catheter with a metal stylette represented the first attempt to render the upper urinary tract opaque to the roentgen rays Meanwhile, the advance in urological surgery had been coincident with the development of gynecological and abdominal surgery, but the greater amount of this surgery was done by general surgeons and gynecologists rather than urological surgeons, who up to that time were practically non existent in our present-day conception of the role

In partial summary, therefore, of the period ending with the turn of the century, we have seen the development of a urological instrument which still exists in its original form, the primitive conception of the trans-uretheral method of handling bladder neck obstruction, the introduction of anesthesia in urology and its influence on general surgery the develop ment of the cystoscope and the application of roentgen rays for the de tection of shadows in the urinary tract All these may be grouped as the foundation stones of modern urological diagnosis because for all practical purposes, the history of urology from the beginning up to the present time, aside and apart from the technical procedures involved and the specialized surgical techniques utilized, is essentially a specialty which has developed and survived by its completeness and exactitude of diag nosis

A somewhat more comprehensive view of the continued progress in urology may be had by grouping the advances and accomplishments of the thirty years from 1900 to 1930 It was during this period that the efforts of the later nineteenth century urologists began to crystallize but as one looks back on that period today, it may seem somewhat remote

It comprised, nevertheless, three decades of achievement which set the tempo for what we may call modern urological practice and diagnosis, and standardized urological surgery In 1905 and 1906, urologists were trying various methods of rendering the ureters and renal pelvis opaque with the aid of roentgen rays, by the method which is now generally known as pyelography Two German urologists, in 1906, were the first to demonstrate successfully by *x* ray a complete and satisfactory outline of the ureter and renal pelvis A bibliography of the many casual attempts to select and to determine an appropriate solution which would provide not only a satisfactory medium but safety factors as well, is relatively unimportant and even disconcerting More important is that attention was directed to the definitive value of pyelography as an aid to urological diagnosis by Braasch of the Mayo Clinic, and it is to him, possibly more than any other worker, together with his associates, Bumpus and Hager that credit should be given for the analysis and study of methods, solutions and techniques which encompassed pyelography and its possibilities Braasch called attention to the value of the method in diagnosis of the following conditions, *viz* (1) normal pelvis, (2) hydronephrosis (3) pyelitis, (4) pyonephrosis, (5) renal tuberculosis, (6) renal tumor (7) renal and ureteral anomalies, and (8) congenital kidney disease This was separate and apart from the localization and identification of renal and ureteral shadows, as well as ureteral obstruction With their subsequent studies of the various changes in the kidney pelvis and ureter as the result of inflammatory changes, the list was completed and Braasch's findings, as presented in his original monograph on pyelography or urography in association with his staff at the clinic, are still today a standard of urological practice in this diagnostic aid

The appointment of Doctor Hugh H Young as head of the Department of Urology in the Johns Hopkins Hospital brought to the field of urology one who became unquestionably the ablest urologist in the country, and whose career continued uninterruptedly and productively until a few years ago His influence and impact on the specialty in the United States has never been and undoubtedly never will be surpassed In addition, the interest of competent surgeons such as Deaver in Philadelphia, Squier, Fuller and Beer in New York, Cabot in Boston, Schmidt and others in Chicago elevated urological surgery from a few glib, articulate venereologists and placed it in the hands of men whose training and instincts were and had always been essentially and basically surgical Their influence still survives in modern urology today

Improvements in the mechanical and diagnostic possibilities of cystoscopic instruments, the knowledge of the physiological changes in kidney function, the changes in blood chemistry, associated with prostatic obstruction, studies in the bacteriology of the urine, the importance of preoperative and post-operative care, and the relationship of these items in prognosis, all received attention during this period elevating the stand

scopic reaction," and most of these were uniformly so severe that cystoscopy was looked on as a major hazard and put on a par or at times considered more serious than major surgical abdominal procedures The urologist of the 1920 s was quite familiar with this point of view and knew that the variety of drugs used in pyelography was in large measure responsible for these reactions The literature of that period is replete with suggestions and accounts of a variety of chemicals, in which the use of many was followed by dire and serious results One era of the use of solutions had followed another from the beginning of pyelography until, in 1918, sodium bromide and sodium iodide solutions of the halogen salts were found to be of sufficient molecular weight to produce shadows which could be interpreted For eleven years these were the standard solutions of choice and much of our basic knowledge of renal, ureteral, and vesical pathology goes back to the study of the pyelograms and cystograms made with these solutions

From the standpoint of evaluating the progress of urology the pyelogram provides the student today with a knowledge of genito urinary pathology as it existed prior to modern antibiotic therapy There were numerous differences of opinion with regard to the indications and contraindications for retrograde pyelography whether or not both kidneys should be injected at the same time etc , but with the advent, in 1929, of organically bound iodide media, the innocuousness of the dye when given in large doses intravenously, and the relative absence of iodism and constitutional local reactions made it possible to discard sodium iodide without delay This was due to the discovery of a compound by Doctor Moses Swick of New York then a Libman fellowship research student in Germany To say that his work revolutionized the entire trend of urologic diagnosis would be a great understatement It is the major contribution to urology of the decade and has been appropriated for use in many other specialties Known in Germany as "uroselectan" and in the United States as 'iopax,' the solution could be injected intravenously and used for retrograde pyelography as well Exposures made at intervals of ten and twenty minutes introduced the possibility of functional disturbance diagnosis and with various refinements in technique, as well as composition of the solution principally the increasing strength, it can be said to be the major drug in the urologic diagnostic armamentarium today Where retrograde pyelography had been contraindicated, excretion urography was valuable in determining the source of hematuria, obstructive lesions congenital anomalies hydronephrosis pyonephrosis, tuberculosis and bladder pathology Its field embraced all parts of urology Today, as a result of Doctor Swick's discovery, it is a completely safe procedure and the urologist feels that both excretory and retrograde pyelography should complement each other in urological diagnosis

It would be inappropriate to finish a discussion of this thirty year period without some reference to prostatic and bladder carcinoma and some mention of what was accomplished, or rather not accomplished, during that time Regrettably, these two conditions have had what is now described as an economic significance in that they were difficult cases to handle No method of treatment was generally satisfactory, and ultimately the patients, if not relieved by a merciful death, required custodial care which was not too readily available Thus they were turned over to *x* ray therapists and a few urologists, many of whom were decidedly handicapped surgically The discovery of radium and its possible utilization in cancer therapy, as well as more powerful *x* ray therapy, both of which were available only institutionally, further narrowed the field of urological care and the period from 1920 to 1930 is a nightmare of radium and *x* ray burns, vesico vaginal and vesical intestinal fistulae and other calamities too numerous to mention An attempt will be made to review the present status of the genito urinary malignancy problem at the end of this urological survey The sole constructive handling of the carcinoma problem had been clearly enunciated by Doctor Young ten years previously, namely, the necessity for early diagnosis and the value of radical perineal prostatectomy with complete removal of the gland and fascia for early carcinoma The principles motivating this therapy are as sound today as when they were first enunciated by Doctor Young The technical difficulties of perineal surgery have always been a problem and many will disagree with this treatment as advocated Statistically, however, and based on the reports of men whose conclusions are completely reliable, the method is essentially sound in early cases

So many events of far reaching importance have taken place during this last twenty three year period of urological review that it is manifestly impossible to comment upon or even list all of them within the balance of this chapter However it would seem to the author that outstanding are (1) the revolutionary changes in chemotherapy which have taken place within the last twenty years (2) the equally and even more important advances in instrumental and surgical treatment of genito-urological conditions, with particular reference to the development and the introduction of the trans urethral method for the removal of the obstructed prostate, or at least a sufficient amount to relieve the obstruction and permit emptying of the bladder and (3) the newer conceptions of the treatment of prostatic carcinoma based on the knowledge of relationship between the hormonal activity of the testes and other endocrine glands in activating and stimulating the prostatic lesions once they have occurred This is particularly important because it is the second commonest malignancy in the male, and it has been variously estimated that there are between 500 000 to 5 000 000 cases in the United States at the present time

Chemotherapy and antibiotic therapy are of the utmost importance first of all because the problem of acute urinary infections was a most serious one in which drug therapy was practically impotent In 1936, sulfanilamide first became available for clinical use Prior to that time a fair measure of success had been obtained with the use of the ketogenic diet and mandelic acid in the treatment of infections There are numerous objections besides that of the cost to the mandelic acid preparations In 1936, the use of sulfanilamide and various similar compounds such as sulfadiazine, sulfathiazole, sulamyd, sulfasuxidine and others became standard procedures in the treatment of urological infections, as well as the pre and post operative care of patients, so that the entire picture was changed almost overnight Observations of extreme value as to the essential blood and plasma levels, excretory rates, drug resisting organisms, etc , were made by urological clinicians who thus contributed largely to the generalized use of these drugs in other branches of medicine and for the treatment of infections elsewhere in the body

With the introduction of penicillin there was a further control in the treatment of infectious disease of the urinary tract and for a period of time the sulfa drugs were somewhat in discard Definite proof was readily available as to the general effectiveness of penicillin, and in all branches of urology, interest in its activity and effectiveness was consistently maintained and evaluated Penicillin was followed by the discovery of the broad spectrum antibiotics or mycetins Simultaneous with the introduction of penicillin, streptomycin became available for clinical use and was found to be of great value in the treatment of urinary tuberculosis This drug is still most effective against all gram negative bacteria but is of principal significance in the treatment of genito urinary tuberculosis As a result of its use and refinements in technique of administration the picture of tuberculosis of the genito urinary tract, which prior to streptomycin was the second commonest site of tuberculosis in the human, has been changed entirely by the use of this and a few newer preparations so that it has profoundly affected the course of thousands of cases Other new mycetins are being announced from time to time, but many of these have not had sufficient clinical evaluation to make them generally acceptable, although several preparations are of value in cases of infections which are penicillin resistant or resistant to other commonly used antibiotics

This whole picture of the sulfa drugs and penicillin, and the mycetins however, has not been without its problems Many cases of allergy have been reported and a recent figure goes as high as 60 per cent of cases in which treatment with these preparations was contraindicated On this account there is now a tendency to prescribe moderate doses of these drugs in association with combinations of the sulfanilamides and at this present writing it would seem that this is the most effective form of therapy for the treatment of urinary infections.

While in most cases striking results have been obtained in the treatment of urinary infections by these new drugs and preparations, it must be borne in mind that most of these cases and particularly a high percentage of recurrent infections have obstructive lesions These lesions are either on an anatomical or pathologic basis as well as due to calculi Therefore, each case must have a thorough diagnostic survey of the entire urinary tract before reliance is placed on chemotherapy alone This point illustrates the favorable position which the well trained and well rounded urologist occupies in availing himself of the various diagnostic aids to which attention has already been directed

I have already mentioned the primitive and early attempts to reduce the treatment of vesical neck obstruction to an instrumental or so called trans urethral procedure One of the chief problems, aside from working blindly, was the complete and utter lack of control of hemorrhage Bumpus of the Mayo Clinic was the first to provide satisfactory hemostasis in modifying his punch with a carrier through which bleeders could be coagulated under direct vision While trans urethral surgery continued in earnest with the Braasch Bumpus instrument, Maxmilian Stern presented his resectoscope with a movable loop When activated this resectoscope produced an electric current of sufficient strength to cut under water and at the same time to coagulate bleeders so that it was possible to maintain a clear field for adequate vision Modifications of the instrument and its various parts appeared rapidly It must be admitted that many of the early operations or so called revisions despite Stern's report to the contrary, were followed by grave consequences and results, the most serious of which was uncontrollable post operative hemorrhage It was a dangerous instrument in the hands of many urologists However, in 1934 Dr M G Alcock of Iowa City at the American Urological Association meeting laid down certain fundamental principles of the operation with a statement of his results mortality, etc , so that urologists, as a whole, were able to have a true and comprehensive picture of all that trans urethral resection implied Further comments on the methods, indications etc , cannot be made for lack of space However, it may be noted that probably one hundred times as many or even more cases of bladder neck obstruction are daily operated on today than before the introduction of the trans urethral procedure where open surgery and perineal prostatectomy were the only two methods available It is appropriate also to call attention to the list of cases operated on at the Mayo Clinic—over 11,000—in a ten year period, with a mortality of less than 1 per cent Dr Gershom J Thompson attributes his low mortality and general satisfactory results to the use of the cold knife in cutting the tissue compared with the excision of tissue by the activated loop as used in the regular type of resectoscope

We now come to a necessarily brief survey of the major problem confronting the urologic surgeon, *viz* , carcinoma of the prostate and car-

cinoma of the bladder Reference has already been made to the incidence of the former Digital rectal examination gives the most valuable in formation before operation and should be done routinely in all men over forty Carcinoma of the bladder should always be borne in mind in all cases of unexplained or painless hematuria, and confirmed by cystoscopic examination Carcinoma of the prostate is the commonest cancer in men over fifty, has an insidious onset, metastasizes and grows progressively until death Claims of cure by radical surgery in cases detected early must be accepted with caution At this writing the treatment of choice in cancer of the prostate would seem to be the hormonal control with estrogens supplemented by castration The object is to alter the endocrine balance at the expense of the androgenic influence This does not remove all sources of androgenic supply, and Huggins has advocated bilateral adrenalectomy in an attempt to control this While results are certain, more satisfactory than prior to hormonal therapy, prostatic cancer and the treatment of early and advanced carcinoma of the bladder still remain a grave problem for the urologist

Regrettably, many of the subjects which go to make up the day to day problem of the active urologist and the modern urological clinic cannot even be sketchily handled here in any detail The problem of urinary calculi, methods of prevention and dissolution, as well as the various conservative methods of handling urinary colic now available must be glossed over

The role of genito urinary anomalies in their relationship to urological disease, the diagnosis and treatment of renal tumors and malignancies can only be listed Finally, some brief mention of pheochromocytoma, which has become of great importance not only in diagnosis but in its relationship to systemic disturbances associated with hypertension, must be made and, lastly, the significance and place of the artificial kidney in urology and its application and possibilities can be referred to only in passing

No review of urology would be complete, however, without mention of Frederick C Wappler and Frederick J Wallace, whose mechanical ingenuity and foresight have brought the splendid array of diagnostic instruments available to the specialty and without which it could not survive Most of these existed only as ideas in the minds of those whose name they bear, and it was the genius of Mr Wappler and Mr Wallace that made them into practical instruments of service Both are recog nized by the honorary membership in the American Urological Associa tion Finally, Dr Frederic E B Foley of St Paul, whose Foley balloon catheter is outstanding among a series of ingenious devices, has revolutionized the treatment of all bladder and vesical neck pathology Dr Foley's catheter, like Mr Wappler's and Mr Wallace's lens systems, has been utilized for a score of diagnostic devices in all branches of

DELEGATES TO THE FIRST WESTERN HEMISPHERE CONFERENCE OF THE WORLD MEDICAL ASSOCIATION

ARGENTINA Walter A Saborido, M D	Buenos Aires
BOLIVIA Enrique St Loup B , M D	La Paz
BRAZIL Doreval Macedo Cardoso, M D	São Paulo
CANADA Leon Gerin Lajoie, M D	Montrea
CHILE Hector Rodriguez, M D	Santiago
COLOMBIA Pedro C Rojas Buitrago, M D	Bogota
COSTA RICA Fernando Quiros Madrigal, M D	San Jose
CUBA Leopoldo E Araujo, M D	La Habana
DOMINICAN REPUBLIC Luis Urena Hernandez, M D	Ciudad Trujillo
ECUADOR Sergio Lasso Meneses, M D	Quito
GUATEMALA Alfredo Gil Galvez, M D	Guatemala
HONDURAS Jose Gomez Marquez, M D	Tegucigalpa

MEXICO	
Ruperto Alvarado, M D	México
NICARAGUA	
German Castillo M D	Managua
PANAMA	
Elias M Cordova, Jr , M D	Panama
PARAGUAY	
Alfredo Ayalahaedo, M D	Asunción
PERU	
Clemente Carbajal, M D	Lima
SALVADOR	
Alfonso Jimenez Castillo, M D	San Salvador
UNITED STATES OF AMERICA	
Louis H Bauer, M D	New York City
Natalio Bayonet, M D	San Juan
Elmer L Henderson, M D	Louisville
URUGUAY	
Lauro Cruz Goyenola, M D	Montevideo
VENEZUELA	
Alejandro Principe, M D	Caracas

SPECIAL GUESTS AND PARTICIPANTS

Francisco J Aguilar, M D	Guatemala
Donald G Anderson, M D	Chicago, Illinois
Edward L Bortz M D	Philadelphia Pennsylvania
Rosendo Amador Fernandez, M D	Mexico
Gunnar Gundersen, M D	La Crosse, Wisconsin
Elmer L Henderson, M D	Louisville, Kentucky
Austin Smith, M D	Chicago, Illinois
Nestor Oropeza M D	Caracas, Venezuela

GUESTS OF HONOR

The Honorable John S Battle, Governor of Virginia, invited the Governors of each of the forty eight states and the Commissioners of the District of Columbia to designate a physician, born in 1878, to attend the First Western Hemisphere Conference as a guest of honor

ALABAMA — Decatur
DR AND MRS FRANK L CHENAULT
Designated by Governor Gordon Persons

ARIZONA — Tucson
CLARA S WEBSTER, M D
Designated by Governor Howard Pyle

ARKANSAS — North Little Rock
DR AND MRS WILLIAM M BURNS
Designated by Former Governor Sid S McMath

CALIFORNIA — Los Angeles
EDWARD F NIPPERT, M D
Designated by Governor Earl Warren

COLORADO — Denver
CUTHBERT POWELL, M D
Designated by Governor Dan Thornton

CONNECTICUT — New Haven
MARVIN M SCARBROUGH, M D
Designated by Governor John Davis Lodge

DELAWARE — Wilmington
JOHN B RUTHERFORD M D
Designated by Former Governor Elbert H Carvel

DISTRICT OF COLUMBIA — Washington
DR AND MRS GEORGE C RUHLAND
Designated by the Board of Commissioners

FLORIDA — Jasper
DR J H CORBETT AND DAUGHTER, DR SYBIL CORBETT
Designated by Governor Dan McCarty

GEORGIA — Cedartown
DR. AND MRS JOHN W GOOD
Designated by Governor Herman Talmadge

IDAHO

DR AND MRS JOHN H CROMWELL — Gooding

Designated by Governor Len B Jordan

ILLINOIS

ALBERTINE L REA, M D — Chicago

Designated by Former Governor Adlai E Stevenson

INDIANA

DR AND MRS GEORGE R DANIELS — Marion

Designated by Former Governor Henry F Schricker

IOWA

DR AND MRS GEORGE B CROW — Burlington

Designated by Governor William S Beardsley

KANSAS

DR AND MRS HENRY E HASKINS — Kingman

Designated by Governor Edward F Arn

KENTUCKY

DR AND MRS DANIEL M GRIFFITH — Owensboro

Designated by Governor Lawrence W Wetherby

LOUISIANA

DR AND MRS JAMES Q GRAVES — Monroe

Designated by Governor Robert F Kennon

MAINE

DR AND MRS GEORGE L PRATT — Farmington

Designated by Governor Burton M Cross

MARYLAND

DR AND MRS LEWIS K WOODWARD, SR — Westminster

Designated by Governor Theodore R McKeldin

MASSACHUSETTS

DR AND MRS JAMES WARREN SEVER — Winchester

Designated by Former Governor Paul A Dever

MICHIGAN

DR AND MRS LOUIS J HIRSCHMAN — Traverse City

Designated by Governor G Mennen Williams

MINNESOTA

DR AND MRS R A BEISE — Brainerd

Designated by Governor C Elmer Anderson

MISSISSIPPI

DR AND MRS HUGH LAWSON MCKINNON — Hattiesburg

Designated by Governor Hugh White

MISSOURI

CHESTER H RISLEY, M D — Cameron

Designated by Former Governor Forrest Smith

MONTANA

DR. AND MRS B K KILBOURNE — Hardin

Designated by Governor J Hugo Aronson

NEBRASKA
Dr and Mrs Louis E Dickinson — Ravenna
Designated by Former Governor Val Peterson

NEVADA
Dr and Mrs Arthur J Hood — Elko
Designated by Governor Charles H Russell

NEW HAMPSHIRE
James W Jameson, M D — Concord
Designated by Former Governor Sherman Adams

NEW JERSEY
Dr and Mrs Watson B Morris — Springfield
Designated by Governor Alfred E Driscoll

NEW MEXICO
Dr and Mrs P L Travers — Santa Fe
Designated by Governor Edwin L Mechem

NEW YORK
Scott L Smith, M D — Poughkeepsie
Designated by Governor Thomas E Dewey

NORTH CAROLINA
Dr and Mrs William H Stratford — Haw River
Designated by Former Governor W Kerr Scott

NORTH DAKOTA
Dr and Mrs Frederick O Gronvold — Fargo
Designated by Governor C Norman Brunsdale

OHIO
Dr and Mrs Frederick W Kehrer — Bucyrus
Designated by Governor Frank J Lausche

OKLAHOMA
Dr and Mrs R M Howard — Oklahoma City
Designated by Governor Johnston Murray

OREGON
Dr and Mrs Charles E Sears — Portland
Designated by Governor Paul L Patterson

PENNSYLVANIA
Dr and Mrs Edgar S Buyers — Norristown
Designated by Governor John S Fine

RHODE ISLAND
Dr. and Mrs Peter P Chase — Providence
Designated by Governor Dennis J Roberts

SOUTH CAROLINA
Dr A A Walden and sister, Mrs W E Montgomery — North Augusta
Designated by Governor James F Byrnes

SOUTH DAKOTA
Dr and Mrs T J Billion — Sioux Falls
Designated by Governor Sigurd Anderson

TENNESSEE

J H Gammon, M D — Knoxville

Designated by Former Governor Gordon Browning

TEXAS

Dr L H Reeves and Daughter, Mrs Robert B Violette — Fort Worth

Designated by Governor Allan Shivers

UTAH

Dr and Mrs Alonzo N Leonard — Salt Lake City

Designated by Governor J Bracken Lee

VERMONT

Julius E Dewey, M D — Montpelier

Designated by Governor Lee E Emerson

VIRGINIA

Dr and Mrs Henry Cowles Rucker — Mattoax

Designated by Governor John S Battle

WASHINGTON

Dr and Mrs Orme R Nevitt — Raymond

Designated by Governor Arthur B Langlie

WEST VIRGINIA

Gustavus B Capito, M D — Charleston

Designated by Former Governor Okey L Patteson

WISCONSIN

Dr and Mrs W B Campbell — Waukesha

Designated by Governor Walter K Kohler, Jr

WYOMING

Dr and Mrs Walter O Gray — Worland

Designated by Governor Frank A Barrett